Second Sight TC

Remote Gas Detection System

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Instruction Manual **1210**

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SECONDSIGHT

Part No. **MANSECONDSIGHT**
Revision **A/12-10**

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Table of Contents

ABOUT THIS MANUAL 8
Format Conventions 8
Notes, Cautions, and Warnings 8
Contacting Customer Support 8

1.0 INTRODUCTION 9
1.1 Notice 9
1.2 Special Warning 9
1.3 Description 10
1.3.1 Detection Head Characteristics 10
1.3.2. Characteristics of the Power Adapter 11
1.3.3. Characteristics of the Portable PC 11
1.4 Operating Principle 12
1.4.1 Autonomous Mode 12
1.4.2 Remote Mode 13

2.0 QUICK START GUIDE AND PHYSICAL PRINCIPLES OF IR GAS CLOUD IMAGING 14
2.1 Receipt of Equipment 14
2.2 Installation Considerations 14
2.3 Starting the System 15
2.4 Ethernet Network Connection between Head and Network 16
2.4.1 Opening a Session 17
2.4.2 Connecting to the Remote Second Sight Application 18

3.0 PHYSICAL PRINCIPLES OF IR GAS CLOUD IMAGING 20
3.1 Second Sight TC Detection Method 20
3.2 Gas Cloud Measurement 21

4.0 COMPONENTS 23
4.1 Detection Head 23
4.2 Power Supply Unit 23
4.3 Portable PC 23

5.0 INSTALLATION 24
5.1 Installation of the Detection Head 24
5.1.1 Attaching the Head on the Tripod 24
5.1.2 Positioning and Orienting the Head 24
5.1.3 Installation of the Power Supply Unit 24
5.2 Installation of the Portable PC 25
5.2.1 Place of Installation 25
5.2.2 Portable PC's Power Supply 25
5.3 Electrical Installation 25
5.3.1 Precautions 25
5.3.2 Ethernet Network Connection between Head and the PC 25
5.3.3 Connecting the Detection Head's Power Supply 25
5.3.4 Connecting the Power Supply Unit 26
5.4 Detector Location Guidelines 26
5.5 Field of View 27

5.6 Environmental Factors 27

6.0 USE AND OPERATION 28

6.1 Operational Principle 28
6.2 Presentation of the Remote Mode 28
6.2.1 Starting the Client Application 28
6.2.2 Remote Connection to Second Sight Camera 29
6.2.3 General Operational Indicators 30
6.2.4 Command Buttons 32
6.2.5 Log Tab 42
6.2.6 Peripherals Indicator Lights 42
6.2.7 Image block Status Indicator 44
6.2.8 Count Down Before Calibration 44
6.2.9 Map Display 44
6.2.10 About 45

7.0 INSTALLING CLIENT SOFTWARE 47

7.1 Installation Guidelines 47
7.1.1. Action #1: Uncompress the Software 47
7.1.2. Action #2: Installation of the XviD Codec 49
7.1.3. Action #3: Installation of the Microsoft Framework V2.0 49
7.1.4. Action #4: Network Parameter 50
7.2 Firewall and Network Parameters 51
7.2.1 Action #5: Firewall Parameter 51
7.2.2. Action #6: Create a Remote Drive 53
7.3. SdSClient First Use 54
7.3.1. Action #7: Create Administrator Account 54

8.0 MODBUS INTERFACE 56

8.1. Ethernet RJ45 Socket 56
8.2. Auxiliary Socket 57
8.3. Communication Protocol 58
8.3.1. IP Video Link 58
8.3.2. Identification Protocol (UDP) Between Client and Server 58
8.4. Modbus IP 58
8.4.1. ModbusProtocol 58
8.4.2. Functions Codes 60
8.4.3. Identification 60
8.4.4. Commands 61
8.4.5. System's Parameters 61
8.4.6. Detection's Parameters 62
8.4.7. Status 62
8.4.8. Zones 65
8.4.9. CIFS Protocol 65
8.4.9. Video Alarms Files 65
8.4.10. Log File 65
8.5. Annex 1 66

9.0 MAINTENANCE AND WARRANTY 67

9.1. Maintenance 67

9.2. Obtaining Service 68
9.3. Warranty 68

10.0 TROUBLESHOOTING GUIDE 69

11.0 CUSTOMER SUPPORT 71

Other Sources of Help 71

12.0 APPENDIX 72

12.1. Specifications 72
12.2. Software Version 72
12.3. Power Supply Specifications 73
12.4. Regulatory Agency Approvals 74

Table of Figures

Figure 1: Second Sight TC Detection Head 10
Figure 2: Power Supply Unit 11
Figure 3: Rugged Portable PC 11
Figure 4: Principle of the Second Sight System 12
Figure 5: Position of the Light Indicators on the Back Side 13
Figure 6: System Human-Machine Interface 13
Figure 7: Packed System 14
Figure 8: Status Indicators 15
Figure 9: Open Ethernet Connector 17
Figure 10: Network Cable 17
Figure 11: Client Software Icon 17
Figure 12: Connected cameras on the Map 18
Figure 13: Network in the Process of Connecting or Not Connected 18
Figure 14: Principal Application Screen 19
Figure 15: Optical Building Blocks of the Second Sight Gas Imaging Camera 20
Figure 16: The Infrared Spectral Filtering Scheme of Second Sight 21
Figure 17: Front and Back Views Detection Head 23
Figure 18: Lock and Safety Device Button 24
Figure 19: Power Supply Connector 26
Figure 20: Connected Power Cable 26
Figure 21: Power Supply 26
Figure 22: Icon of Client Software on the Desktop 28
Figure 23: Remote Session Screen 29
Figure 24: Different Connected Cameras 30
Figure 25: Network in the Process of Connecting or Not Connected 30
Figure 26: Hourglass Indicator 31
Figure 27: Grey Indicator 31
Figure 28: Green (Normal Operation) Indicator 31
Figure 29: Exclamation Mark Indicator 31
Figure 30: Alarm Gas Indicator 32
Figure 31: Login Icon and Login Window 32
Figure 32: Login Window and Additional Icon 32
Figure 33: Creation of New Account Window 33
Figure 34: Change Standby Mode or Detection Mode 33
Figure 35: Zones Icon 33
Figure 36: Active and Inactive Zones 34
Figure 37: Mute Buzzer Icon 34
Figure 38: Configuration Icon 35
Figure 39: Configuration Window 35
Figure 40: Gas Icon 36
Figure 41: List of Gases 36
Figure 42: Camera Parameters Icon 37
Figure 43: Camera Window 37
Figure 44: Manual Focus Buttons 38
Figure 45: Graph Icon 39
Figure 46: Graph Window 39
Figure 47: Video Icon 39
Figure 48: Video Recorder Windows 40
Figure 49: Record Video Icon 40
Figure 50: Recording Mode (Red Square) 41

Figure 51: Stop Icon 41
Figure 52: Confirmation Popup 41
Figure 53: “Log” Window Example 42
Figure 54: Peripheral Indicator Lights 42
Figure 55: Infrared Sensor’s Status Indicator 42
Figure 56: Status Indicator for the Lens Cover Command 43
Figure 57: Temperature Sensor’s Status Indicator 43
Figure 58: Status Indicator of the Filter Wheel 43
Figure 59: Power Status Indicator 43
Figure 60: Image Block Bar Graph 44
Figure 61: Non-accurate Measurement Indicator Light 44
Figure 62: Countdown before Calibration 44
Figure 63: Map Display 45
Figure 64: About Second Sight Client Software 46
Figure 65: Create a New Folder 47
Figure 66: New Second Sight Client Empty Folder 47
Figure 67: Second Sight Client Folder 48
Figure 68: Create a Shortcut 48
Figure 69: SdSClient Shortcut Icon on the Desktop 49
Figure 70: The XviD Final Installer 49
Figure 71: The Framework Express Setup 49
Figure 72: Last Screen of the Framework 2.0 Installation 50
Figure 73: Local Area Connections Properties Windows 50
Figure 74: Firewall Window 52
Figure 75: Firewall Exceptions Tab 52
Figure 76: Selection of SdSClient Software 53
Figure 77: Selection of Exceptions Software 53
Figure 78: Mapping Network Drive Z: 54
Figure 79: Create Administrator Account 55
Figure 80: Second Sight TC 56
Figure 81: Back View of Camera 56
Figure 82: Pin of the Auxiliary Connector 57
Figure 83: Wiring of the Auxiliary Connector 57
Figure 84: Infrared Image 58
Figure 85: Modbus Link 59
Figure 86: Modbus TCP/IP Encapsulated Frame 59
Figure 87: MBAP Header 59
Figure 88: Function Codes 60
Figure 89: Identification Parameters 60
Figure 90: Available Commands 61
Figure 91: System’s Parameters 62
Figure 92: Status 65
Figure 93: Inhibited Zones 65
Figure 94: Error Codes 66
Figure 95: Non-accurate Measurement Indicator Light 67

Table of Tables

Table 1: Meaning of the Light Indicators 16
Table 2: Troubleshooting Table 70

About This Manual

This manual provides instructions for operating, and maintaining the General Monitors (GM) Second Sight TC. The intended audience includes installation personnel, field service technicians, and other technical staff involved in using a Second Sight TC.

Format Conventions

Several format conventions are used throughout this manual for Notes, Cautions, and Warnings. These conventions are described below.

Notes, Cautions, and Warnings

NOTE: Notes provide supplementary details such as exception conditions, alternate methods for a task, time saving tips, and references to related information.

CAUTION: These notices describe precautions to prevent hazardous conditions that may damage the equipment.

WARNING: These notices describe precautions to prevent hazardous conditions that may cause injury to people working with the equipment.

Contacting Customer Support

For additional product information not contained in this manual, please contact General Monitors Customer Support. Refer to Section 9 for contact information.

1.0 Introduction

Loss of gas containment in the oil and gas and chemical process industries can have undesirable safety and environmental consequences. If leaks are not discovered at an early stage, they can accumulate into dangerous gas clouds that can ignite and create explosions or inflict harm as toxic agents. Gas leaks produce a financial loss as well. A recent report by British Petroleum estimates a single cavity pressure vent at an unmanned offshore platform released approximately 500 m^3 (17,970 ft^3) of hydrocarbon gas per day or the equivalent of £10,000 ($19,900) over a four week period[1]. The same report estimates the oil and gas concern loses about 4,000 tons of natural gas per year due to fugitive emissions.

IR gas cloud imaging offers several benefits that complement conventional and ultrasonic gas detection methods. First, IR gas imaging provides continuous wide area coverage per device, with typical spans of 1 km in length by 0.5 km in width (approx. 0.6 mi by 0.3 mi). With fields of view of 15° to 60°, IR cameras can supervise entire sectors of a plant with detailed spatial resolution. Second, IR gas imaging conveys a rich stream of information: the dynamic representation of gas flux allows users to identify not only the specific zones from which gas plumes originate, but also the direction of dispersal, leading to efficient responses to hazardous events. Finally, imaging is immune to major sources of false alarms. Due to the characteristics of the absorption bands for most hydrocarbon gases, IR imaging is unaffected by the absorption of water, carbon dioxide, and other atmospheric constituents present in a plant atmosphere.

1.1 Notice

All information contained in this instruction manual applies only to the setup and operation of the Second Sight TC remote gas detection system. The IR gas cloud imaging camera is easy to set up and operate. Nevertheless, this manual should be read in full, and the information contained herein understood, before attempting to operate it.

The Second Sight TC remote gas detection system is designed and manufactured by Bertin Technologies[2].

1.2 Special Warning

WARNING: Toxic, combustible and flammable gasses & vapors are very dangerous. Extreme caution should be used when these hazards are present.

CAUTION: Avoid shocks to the detection head. The system is designed to operate between -10°C and 55°C and be stored between -20°C and + 60°C.

1 BP Report BH300101, BP SNS Environmental Publication.

2 www.bertin.fr

1.3 Description

1.3.1 Detection Head Characteristics

The detection head is based on passive multi-spectral infrared imaging technology. The system is shipped with a lens with a 30° average field and a database chosen chose for detecting methane, ethane, propane and butane. The following figure represents the front and back views of the head.

Figure 1: Second Sight TC Detection Head

The system can operate autonomously or connected to the portable PC.

The detection head's electric power is provided with a specific power supply unit included in the system's shipment. The head's power consumption is approximately 80 W.

Under the sun visor, an automated mechanism can be used to close the window of the infrared lens. This cover performs two functions:

- Protection of the infrared lens during transport
- Black body to periodically standardize the infrared image.

1.3.2. Characteristics of the Power Adapter

The power supply unit operates on 100-240V / 50-60Hz line power, and powers the detection head (24V direct current), the power supply unit's consumption is approximately 80 W.

Figure 2: Power Supply Unit

The power supply is certified by the following regulatory agencies:

- CE Mark
- ATEX EX II 3 G (Ex nA II T4)

The technical specifications are provided in Section 10.2.

1.3.3. Characteristics of the Portable PC

The laptop PC provided as an option with the system is a DELL laptop model Latitude E6400 ATG (or equivalent ruggedized laptop).

Figure 3: Rugged Portable PC

1.4 Operating Principle

The operating principle is that infrared radiation emitted by objects produces thermal contrast, which when detected by an infrared camera, can provide a measure of gas concentration. Gas is identified by comparing the emissivity of the gas across several filters with those of a library of calibration gases.

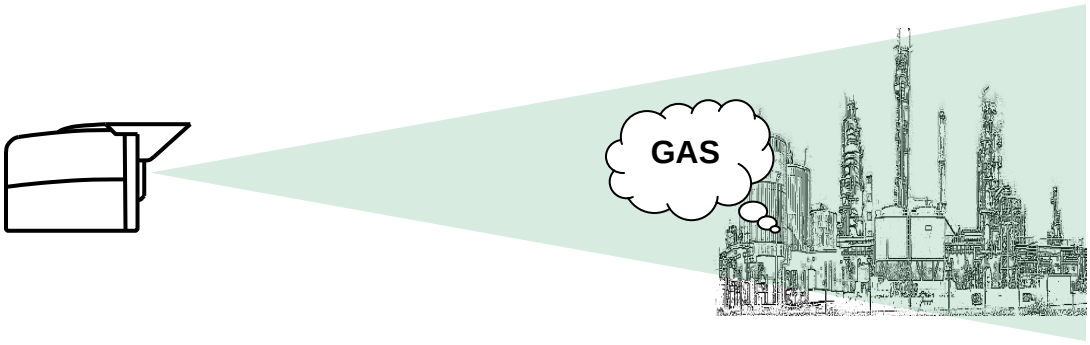


Figure 4: Principle of the Second Sight System

The system, which is entirely passive, makes a spectral analysis of the scene at a distance using an appropriate filter set. The system updates the measurement in a time less than 2 seconds.

The use of an infrared camera requires automatic recalibration regularly every 30 minutes. This makes the system blind for a few seconds, which is indicated by the system's general status indicator.

The head of the Second Sight detection system is entirely autonomous, the portable PC is only connected to the head as a client in order to view alarms and adjust the surveillance parameters. The fact that the client is connected to the head does not influence the detection system's operation.

1.4.1 Autonomous Mode

The autonomous mode refers to the head's operation when the client (portable PC) is not connected. In autonomous mode, the head performs the detection with the last parameters defined by the user. When a detection alarm goes off, the red light located on the back of the head blinks and an audible signal is made. When operation is normal without alarm, only the green light is on.

The following figure shows the position of the lights on the head.

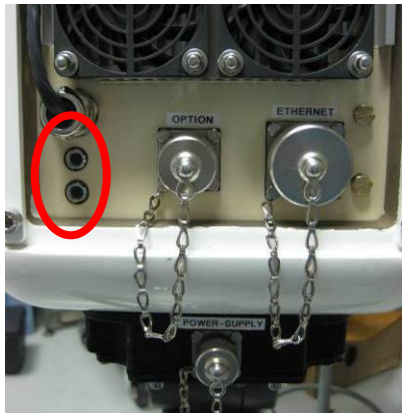


Figure 5: Position of the Light Indicators on the Back

1.4.2 Remote Mode

The remote mode interfaces with the detection head with the help of the portable PC, in order to visualize the system status and detections, make adjustments, activate or deactivate the system, etc. The following figure shows an overall view of the human-machine interface (HMI).

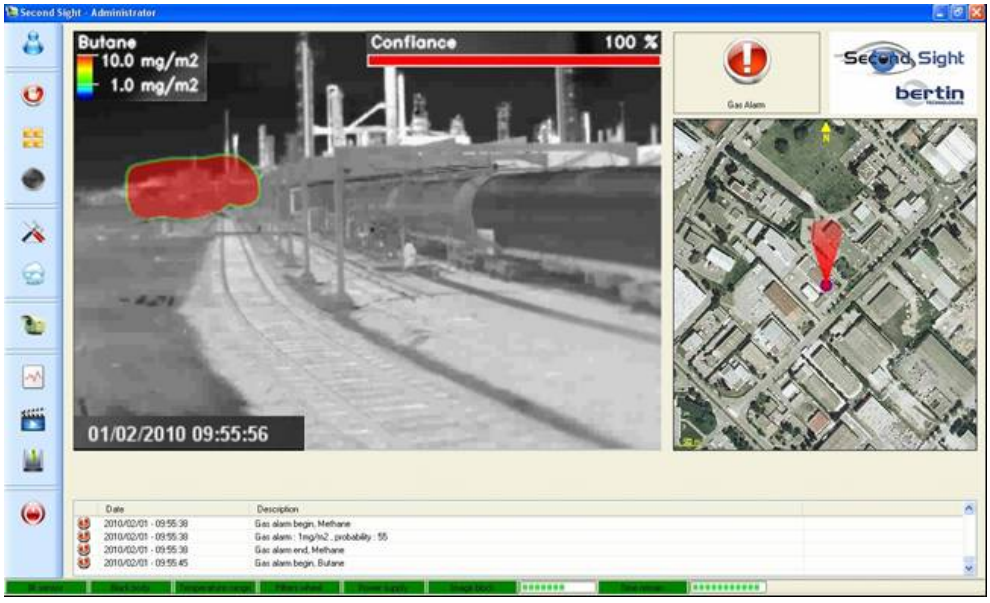


Figure 6: System Human-Machine Interface

2.0 Quick Start Guide and Physical Principles of IR Gas Cloud Imaging

2.1 Receipt of Equipment

Each element of the Second Sight system is shipped in a separate container. The following figure shows the complete packed system.

Figure 7: Packed System

The Second Sight head is shipped in its transport container (Pelicase 1660). In order to take it out of its housing, place your hands in the holes on both sides of the head (see green arrows), and grip it by its sides. Be careful, the head weighs 18 kg (40 lbs).

CAUTION: Be sure not to grip or apply force on the hood visor.

2.2 Installation Considerations

There are no standard rules for placement, since the optimum location varies with each application. Some factors to consider when selecting locations are the following:

- System should be accessible for occasional response checks.
- The line of sight should be free from items that may block the beam (i.e. building, parked truck or moving machinery).

- The unit should be reasonably protected.
- The unit should not be mounted too close to a radio transmitter or similar equipment.
- Mount the Second Sight TC unit so that direct sunlight does not enter the front window.
- Locate the unit away from concentrated sources of heat.
- Mount away from sources of excessive vibration and away from high voltage/high current power lines.
- The tripod must be installed on a stable surface. The legs must be spread out as far as possible to assure good system stability. The length of the legs must be adjusted so that the level is horizontal.

2.3 Starting the System

The detection head is powered up directly by the power supply unit. The system status is indicated by two light indicators located on the back of the head and a buzzer inside the head. The following figure indicates the position of the status indicators on the head.

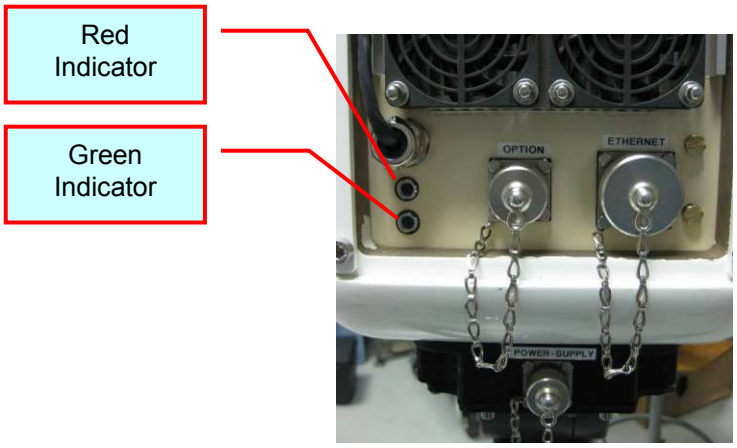


Figure 8: Status Indicators

After powering up the light indicators light up in a continuous way, after a few seconds (approximately 30 seconds) the 4 fans begin to turn.

Then, while initializing the on board driver software, the green and red lights blink. After the head has finished its initialization, if an anomaly has been detected at the self-test level, the green light goes out and the red light lights up continuously.

If the initialization has been performed correctly and no anomaly has been detected during self-tests, the red light turns off. The green light then lights up continuously if the system is in stand-by (non-active surveillance), or blinks if the surveillance mode is active.

A gas detection alarm is indicated by the red light blinking, the green light turning off and a beep. The table on the following page summarizes the various states:

Green Light	Red Light	Buzzer	Description
			Turning on the system. **Warning! The fans are powered up for approximately 35 seconds after connecting the power supply unit's.**
		One short beep	One short beep indicates the beginning of the system initialization. During the entire initialization the two lights blink.
			The system has started up, the stand-by mode is activated, with no surveillance.
			The system has started up, the surveillance mode is activated.
		Repeated beeps	Indicates a detection of gas.
			An anomaly has been detected during the system's monitoring self-tests.

Table 1: Meaning of the Light Indicators

2.4 Ethernet Network Connection between Head and Network

The system can operate in two modes, autonomous or remote, while the detection method remains the same. Only the user interface makes the two operational modes different.

Using the Ethernet network cable provided with the system one can establish a connection between the detection head and the portable PC (100 meters maximum allowed before repeaters are required). From the back of the camera, unscrew the connector's protective cap. Insert the cable, and then turn the connector ring.

Figure 9: Open Ethernet Connector

Figure 10: Network Cable

2.4.1 Opening a Session

Start up the laptop, when the window session is open, a shortcut on the screen called "Second Sight Client" is used for starting the client software:

Figure 11: Client Software Icon

2.4.2 Connecting to the Remote Second Sight Application

When the client software finds the SOCIS camera on the Ethernet LAN, a camera appears on the map. To connect the laptop on this camera one must click on the green icon dedicated to this camera. A blue overlay will overcome the selected camera. This interface allows the user to choose the connected gas imaging system.

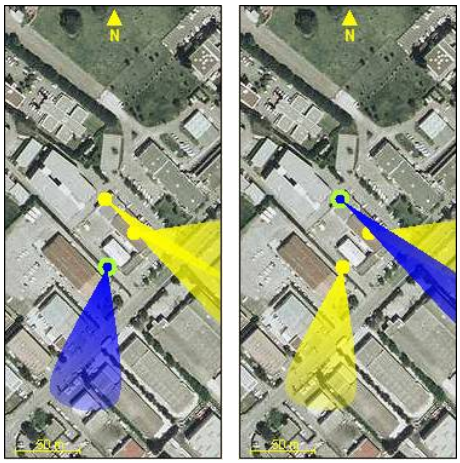


Figure 12: Connected cameras on the Map

If the connection is not made, take the following actions:

- Check the Ethernet network cable connection between the detection head and the portable PC. In the task bar (next to the clock) an icon indicates the status of this connection.

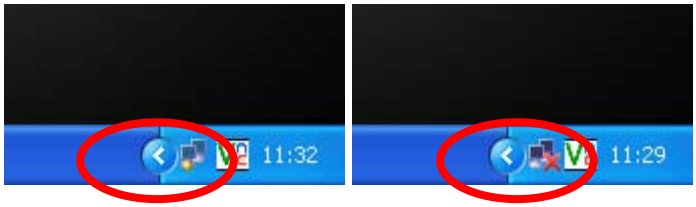


Figure 13: Network in the Process of Connecting or Not Connected

- Check the status of the detection head with the help of the indicator lights (see Table 1).
- As a last resort, perform a “hard reboot” of the detection head, stopping it (unplug the power supply unit) for a minimum of 30 seconds, then restart (plug the power supply unit again).

WARNING: Restarting must occur at least 30 seconds after stopping.

When running for the first time, the application appears as in the following figure:

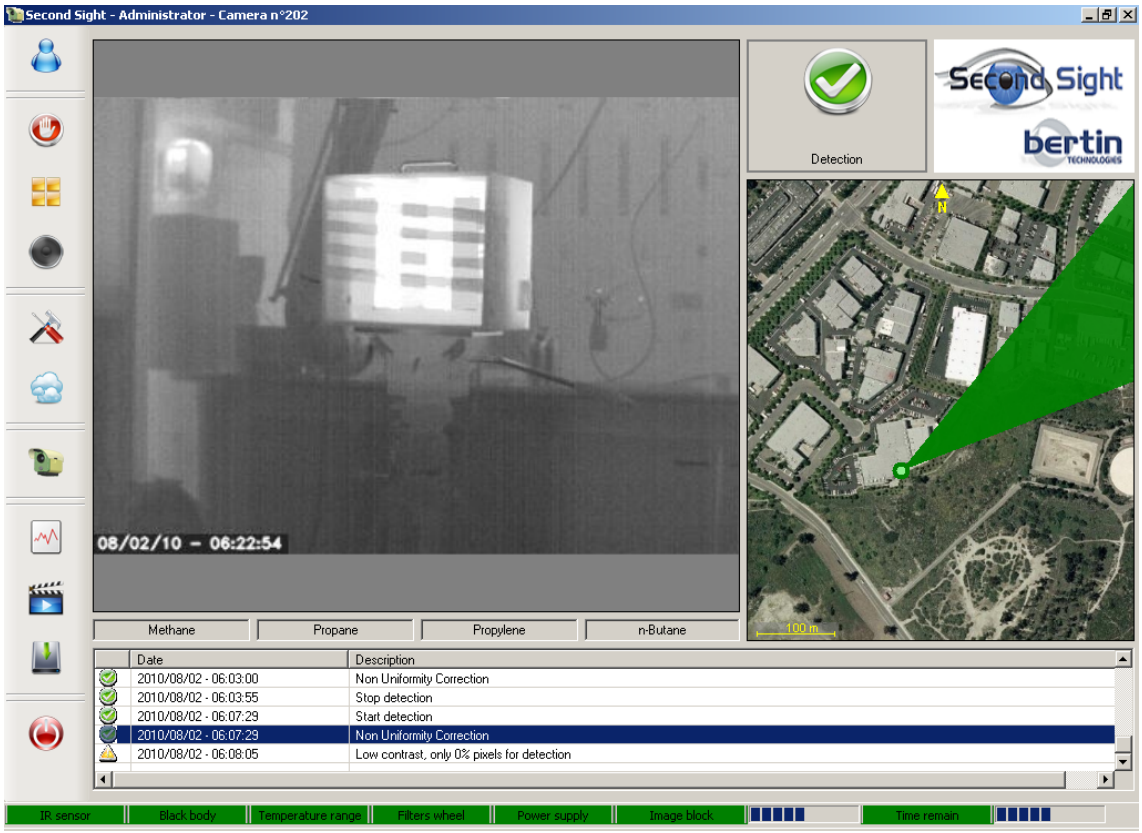


Figure 14: Principal Application Screen

By default, the application is in user mode.

3.0 Physical Principles of IR Gas Cloud Imaging

3.1 Second Sight TC Detection Method

An imaging system comprising of a long wave IR focal plane array and collection optics will be sensitive to all radiation in the 8 to 14 micron wavelength region. Whereas this may be sufficient for thermal imaging applications that monitor the surface temperature of hot objects, the detection, identification (gas type) and quantification of a gas cloud require the use of specific infrared filters to perform a multi-spectral analysis of the incoming IR radiation. Infrared point and open path gas detectors like the IR400 and IR5500 from General Monitors use a single reference filter and a single active filter. The term “active” refers to the fact that infrared radiation transmitted by this filter is affected by the presence of the gas to be detected via absorption, whereas the term “reference” refers to the fact that infrared radiation transmitted by this filter is not affected by the presence of the gas to be detected. The two filters traditionally used in infrared point and open path gas detectors do not provide for identification or discrimination of the gas type or species, i.e., the detector will respond to any gas that absorbs at the active wavelength without informing the user which type of gas has crossed the optical beam path. When using Second Sight, there is provision for up to six infrared filters mounted on a filter wheel. The use of multiple filters allows the camera to simultaneously identify, quantify, and display the type and amount of gas within a family. For example, gas clouds of methane, propylene and butane – important members of the VOC family and constituents of natural gas, can be detected, quantified and displayed on a viewing monitor. Figure 15 shows the optical arrangement inside the Second Sight gas imaging camera. The filter wheel motion is synchronized with the image acquisition and processing function of the camera.

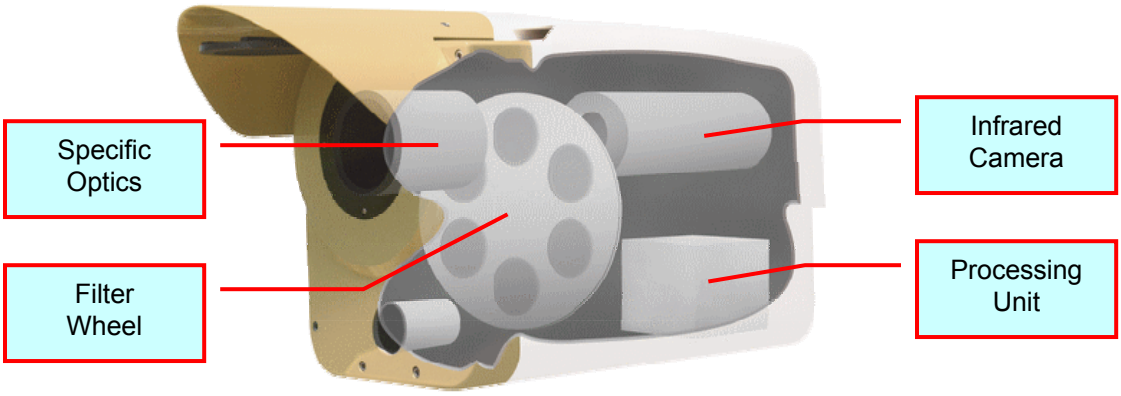


Figure 15: Optical Building Blocks of the Second Sight Gas Imaging Camera

Point and open path infrared gas detectors, along with several commercially available imaging cameras, utilize narrow band infrared filters to separate the radiation at the reference and active wavelengths from the broad thermal radiation emitted by the infrared source or background. The infrared filters of Second Sight are different, with the transmission profile shown in Figure 16. They permit radiation at wavelengths longer than a cutoff wavelength to be transmitted. This enables the imaging function of the camera to be more fully utilized; the infrared flux falling on the FPA is not the miniscule amount that would be transmitted using the

conventional narrow band pass filter approach. The reference filter has the longest wavelength cutoff and is not affected by the presence of gas. It enables the background scene and the infrared radiation background from the scene to be defined. The active filters, known as measurement filters, have shorter cutoffs and are sensitive to the presence of gas. The cutoff wavelengths are selected per gas to be detected. As shown in Figure 16, the active filter 1 will detect methane gas, whereas active filter 2 will not detect methane gas. Differential radiometry techniques are used to compare the images obtained through the measurement and reference filters, to subsequently provide quantitative information for each gas detected.

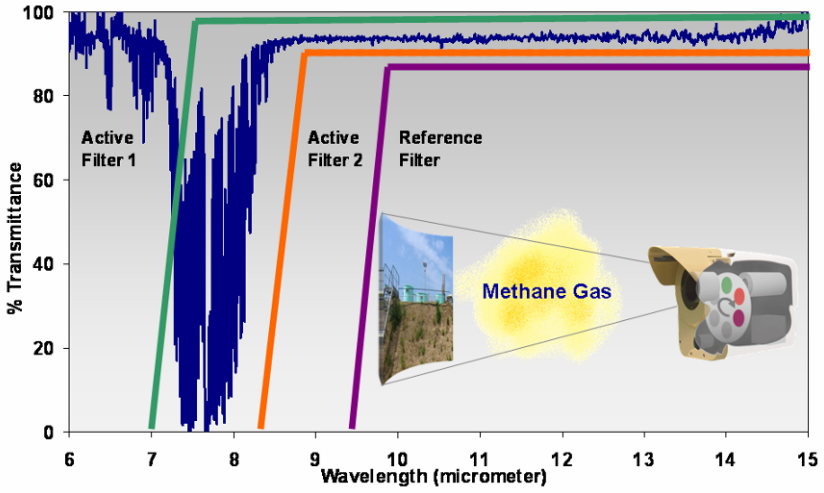


Figure 16: The Infrared Spectral Filtering Scheme of Second Sight

As the system have six different filters, one can imagine a lot of couple of reference / active filters and each gas (depending on it's absorption spectra) will done a specific response on all the different filters couple. This specific "signature" of the gas on all the different filters couple, will be use by the system to identify the chemicals compounds.

The building blocks of the imaging camera described above, along with sophisticated image processing techniques to improve signal to noise and eliminate false alarms, result in a remote gas detection system designed to provide an additional layer of safety in the detection of combustible gases.

3.2 Gas Cloud Measurement

In addition to supplying a large area of coverage and the simultaneous detection of four combustible gases, Second Sight is designed for ease of use. A human machine interface, illustrated in Figure 6: System Human-Machine Interface, allows operators to see target gases as they are detected by the IR camera. Levels of gas concentrations overlaid on the image provide a unique picture of gas dispersal that allows personnel not only to address the source of a leak, but also to respond more effectively to an alarm based on the direction of motion of the gas cloud. The gas measurement provided by the Second Sight is in units of LEL-m. This detection unit of concentration time path length is the same as that used for open path combustible gas detectors like the IR5500 from General Monitors. This is because both open path and imaging gas detection calculate the presence of gas over a path length rather than at a single point. The red color indicates that the presence of butane is in excess of that required

to trigger the alarm, while yellow indicates warning and green the detection of the gas at low levels. The image is updated every 2 seconds, while the Second Sight can indicate an alarm within 8 seconds. The minimum detection levels are gas specific:
a) 0.1 LEL-m for methane,
b) 0.1 LEL-m for propylene,
c) 0.5 LEL.m for propane, and
d) 0.3 LEL-m for butane.

Second Sight can also be factory configured for a host of other gases.

Second Sight is designed for continuous operation, outdoors and indoors, day and night. It has good immunity to common sources of infrared radiation that are potential false alarms. This is because the detection of gas is carried out by three differential infrared imaging processes: spatial, spectral and temporal. Further details of the image processing techniques employed are available elsewhere[3,4].

[3] J. L. Maillart et al., "Second Sight: Stand-off Equipment for Chemical Gas Detection," 9th Symposium on Protection Against Chemical and Biological Warfare Agents, Gothenburg, Sweden, May 22 – 25, 2007.

[4] P. Bernascolle and G. Pelous, "Remote Detection of Natural Gas Clouds in Open Field Imagery," SPIE Aerosense Conference, Orlando, Florida, USA, April 1999.

4.0 Components

4.1 Detection Head

The detection head is based on passive multi-spectral infrared imaging technology. The system is shipped with a lens with a 30° average field and a data base chosen specifically for selecting the following gases: methane, ethane, propane and butane.

The following figure represents the front and back views of the head.

Figure 17: Front and Back Views Detection Head

The system can operate autonomously or connected to the portable PC. The detection head's electric power is provided with a specific power supply unit optional in the system's shipment. The head's power consumption is approximately 100 W. Under the sun visor, an automated mechanism can be used to close the window of the infrared lens. This cover performs two functions:

- Protection of the infrared lens during transport
- Black body to periodically standardize the infrared image

4.2 Power Supply Unit

The power supply unit operates on 100-240 V / 50-60 Hz line power, and powers the detection head (24V direct current) the power supply unit's consumption is approximately 100W.

4.3 Portable PC

The laptop PC provided as an option with the system is a Dell laptop model Latitude E6400 ATG (or equivalent ruggedized laptop).

5.0 Installation

5.1 Installation of the Detection Head

5.1.1 Attaching the Head on the Tripod

Before installing the detection head on the tripod, it is appropriate to check all the locks of the tripod's moving parts, in particular the site and bearing lock buttons of the swivel joint.

To install the head on the tripod, the base plate (attached under the head) must be slid from the back to the front. The safety device engages automatically, and is then locked with the button at the back.

To remove the head, unlock the brake then push the safety lock device button. Then, slide the attachment plate into the dovetail towards the back of the head. These operations are easier if performed by two people.

The following figure shows the attachment support of the head on the tripod:

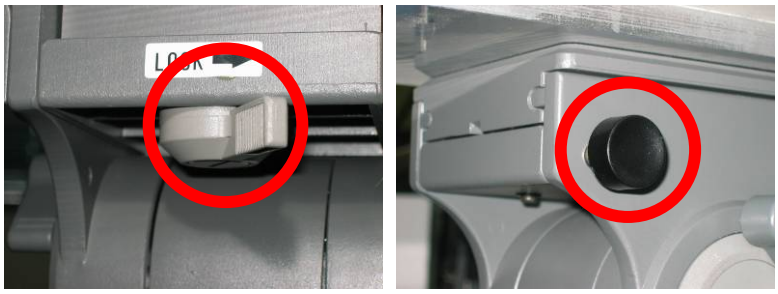


Figure 18: Lock and Safety Device Button

5.1.2 Positioning and Orienting the Head

The tripod is a classic type, each axis has a brake and lock device. The length of the legs and how far they open is adjustable. The most stable recommended position is that in which the "spider" is most open.

5.1.3 Installation of the Power Supply Unit

The power supply unit must be installed at a distance less than 2 meters from the detection head.

5.2 Installation of the Portable PC

5.2.1 Place of Installation

The shipped portable PC (as an option) is a rugged portable PC, which means that it is resistant to shocks and vibrations (MIL-STD 810F). It is also designed to be compliant with IP 54, which means it is resistant to water and dust. In addition, the laptop can withstand falls from a height of 90 cm and may be used in extreme climatic conditions as low as -10°C. It can be moved at a maximum distance of 100 m from the detection head.

5.2.2 Portable PC's Power Supply

The autonomy of the portable PC's battery is approximately 5 to 6 hours. For prolonged use, use the power adaptor provided with the PC.

5.3 Electrical Installation

5.3.1 Precautions

When running the cables, avoid placing them where they can be crushed by pedestrian or vehicle traffic or pinched by a closing door or hatch. Be careful not to expose the cables to a heat source. The line power is connected last.

5.3.2 Ethernet Network Connection between Head and the PC

Using the Ethernet network cable provided with the system one can connect the detection head to the portable PC (100 m maximum length without repeaters).

From the side of the head, unscrew the Ethernet connector's protective cap (Figure 9). Insert and then turn the connector ring. Then connect the cable on the PC.

5.3.3 Connecting the Detection Head's Power Supply

The power supply cable provided with the system is for powering the head. On the back of the head, unscrew power supply protective cap.

Figure 19: Power Supply Connector

Insert and then turn the connector ring.

Figure 20: Connected Power Cable

5.3.4 Connecting the Power Supply Unit

Figure 21: Power Supply

Then connect the cable to the line power.

5.4 Detector Location Guidelines

Several variables are involved in selecting locations to install IR gas cloud imaging cameras. There are no hard and fast rules defining the optimum location to ensure proper gas detection. Nevertheless, the following general guidelines should be followed when installing the camera:

- Avoid areas in which objects are known to move frequently, particularly when said objects occupy a large portion of the camera's field of view
- Avoid areas in which the contrast is poor
- Point the camera downward so as to avoid direct sunlight
- Install the camera on a stable surface
- Avoid large obstructions in the field of view
- Do not install a camera below a glass or plastic window or any other material that attenuates IR radiation

5.5 Field of View

The lenses, along with the size of the FPA, determine the range and field of view (FOV). Second Sight uses a set of germanium lenses coated for optimum transmission in the long wave infrared region. The optics can be factory selected to provide a wider field of view at a shorter range of detection or a narrower FOV and a longer range (see options below):

- 30° FOV for 1,000 meters range (standard factory setting)
- 12° FOV for 2,000 meters range (optional)
- 60° FOV for 500 meters range (optional)

5.6 Environmental Factors

- Observe the ambient temperature range for the specific model – refer to Environmental Specifications. For outdoor installations or other areas exposed to intense, direct solar radiation, the detector may reach temperatures well above specifications. For this condition, a shade cover may be required to bring the detector temperature within specifications. As with any cover or object nearby, make sure the field of view of the detector is not obstructed.

- Avoid conditions of ice build up on the optical detector windows. Complete icing-over of the IR window can result in fault conditions.

6.0 Use and Operation

6.1 Operational Principle

In autonomous mode, the application runs automatically and loads the last configuration defined by the user. Events are indicated only by the lights and buzzer on the back of the detection head.

In the remote operational mode, the operator can access (via the portable PC interface) the most complete data on the system's status. One can view the visible or infrared video, perform adjustments, and consult the recorded data.

6.2 Presentation of the Remote Mode

6.2.1 Starting the Client Application

When the head is turned on, the server application automatically runs and loads the last parameters used.

Start up the laptop.

Once the window session is opened, a shortcut on the screen called "Second Sight Client" is used to start the client software which connects directly to the head:

Figure 22: Icon of Client Software on the Desktop

When the connection is performed, the following screen is displayed:

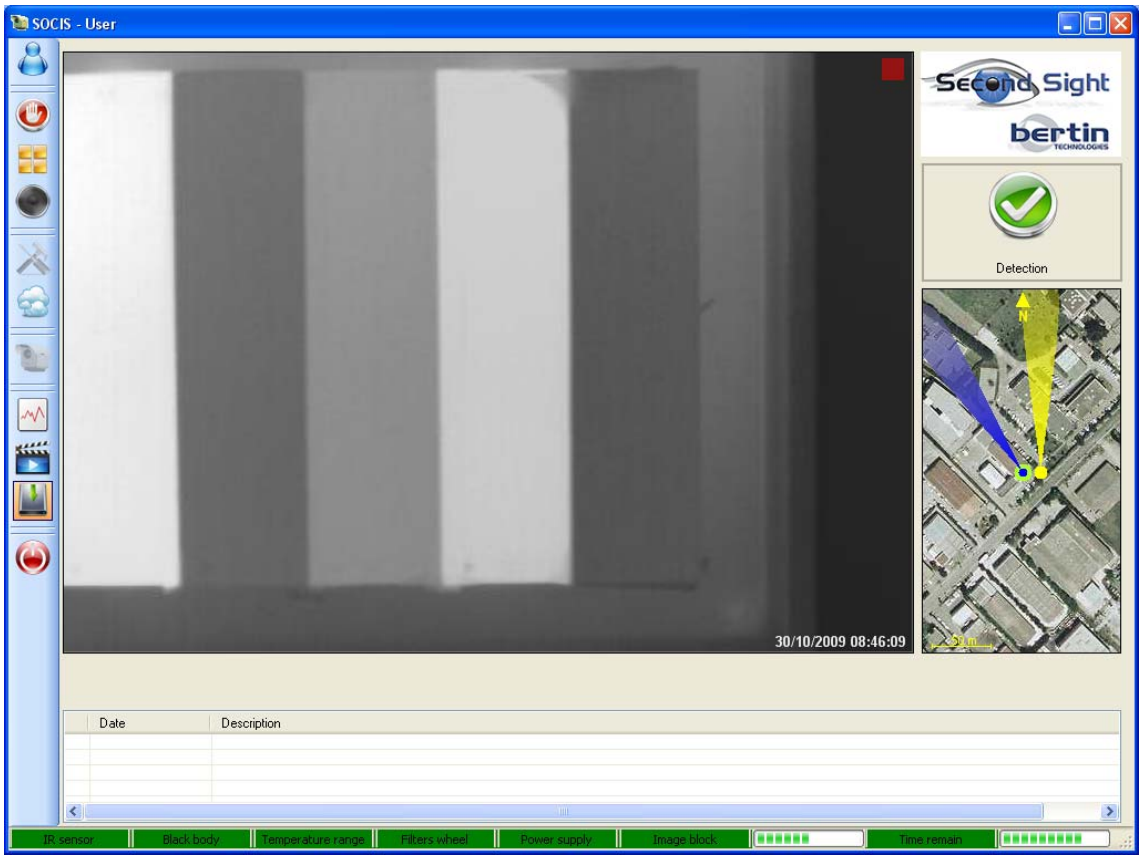


Figure 23: Remote Session Screen

6.2.2 Remote Connection to Second Sight Camera

When the client software found a Second Sight camera on the Ethernet LAN, a camera appears on the map. To connect the laptop on this camera you must click on the green icon dedicated to this camera. A blue overlay will overcome the selected camera. This user friendly interface allows the user to choose the connected gas imaging system. The field of view depends in the image on the lens embedded in the camera.

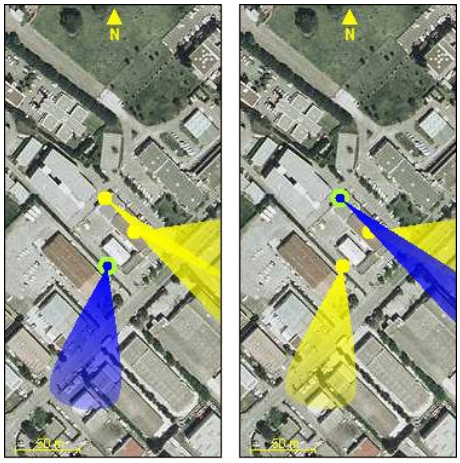


Figure 24: Different Connected Cameras

If the connection is not made, take the following actions:

- Check the Ethernet network cable connection between the detection head and the laptop. In the task bar (next to the clock) an icon indicates the status of this connection.

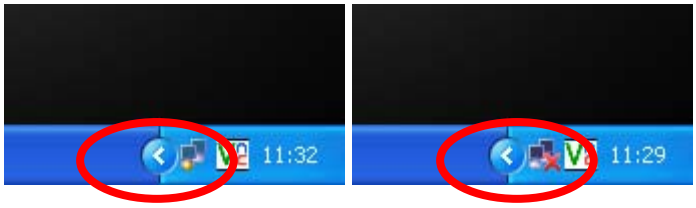


Figure 25: Network in the Process of Connecting or Not Connected

- Check the status of the detection head with the help of the indicator lights (see table paragraph 3.2).
- Try a software reboot of the system by using the Start / Stop icon on the client software.
- As a last resort, perform a “hard reboot” of the detection head, stopping it (“off” on the power supply unit) for a minimum of 30 seconds, then restart (“on” on the power supply unit).

WARNING: Restarting must occur at least 30 seconds after stopping.

6.2.3 General Operational Indicators

A series of status lights located in the right-hand corner of the graphical interface lets the user view the system status.

The colors code is simple:

- Hourglass: the system is in initialization mode.

Figure 26: Hourglass Indicator

- Grey: the system is ok but it is not in detection mode, or it is not connected, try to check the network cable.

Figure 27: Grey Indicator

- Green: the system is operating normally. The gas concentration measurement is valid.

Figure 28: Green (Normal Operation) Indicator

- Yellow (yellow exclamation point): the system is operating, but the measurement is not effective.
  Two possible reasons: Either the system is recalibrating the infrared camera, in which case the detection will restart after a few seconds, or the scene contrast is not sufficient for various possible reasons (bad weather, or because the infrared lens is dirty).

Figure 29: Exclamation Mark Indicator

- Red: When the system is in surveillance mode, a gas detection alarm is indicated by the red indicator. The alarm goes off when the gas level measured in the scene surpasses the alarm threshold.

Figure 30: Alarm Gas Indicator

6.2.4 Command Buttons

Command buttons are localized on the right hand of the main MHI.

6.2.4.1 Change the User

The application offers the possibility to trace the system's users. For this, a login system with password allows for identifying the system's user. Click once on the login icon to modify the current user and access the login window.

Figure 31: Login Icon and Login Window

The login window is user level dependant; the administrator level can create new account, and the login window is the following:

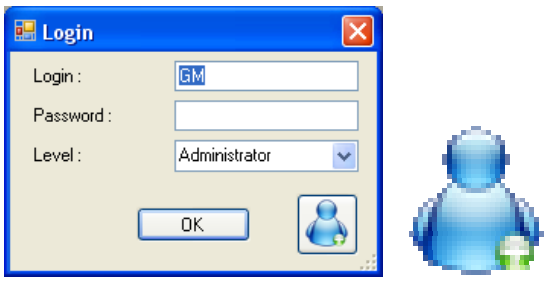


Figure 32: Login Window and Additional Icon

A click on the icon opens a new window where the administrator can create (and remove) new accounts (ex. login, password, and level).

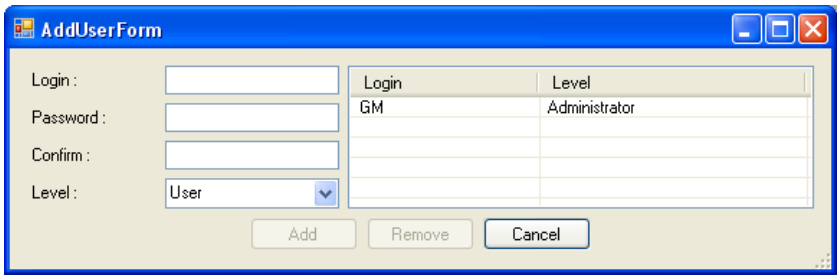
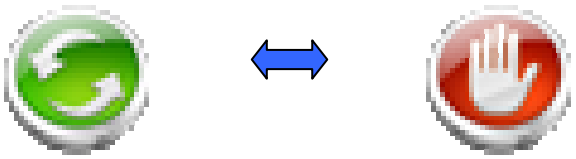


Figure 33: Creation of New Account Window

6.2.4.2 Surveillance and Detection Mode

You can use the button below to change the operational mode: active surveillance mode (detection) or standby mode without surveillance. It can take the two following aspects:

Detection stopped. Click to launch detection



Detection in progress. Click to stop detection

Figure 34: Change Standby Mode or Detection Mode

This action is user's level dependant:

- User level: Disable
- Supervisor level: Enable

6.2.4.3 Zones Icon

Figure 35: Zones Icon

The Zones icon allows operators to create zones of interest in the infrared image. Each zone may be active (gas detection is done in this zone) or inactive (gas detection is not activated in this zone). This function is useful for inhibiting vehicle crossing zones, for example.

On the infrared image we have the display of two things. First, a square grid, one can with the mouse (and enough user privilege) clicks on each square to change from active (clear transparent squares) to inactive (light green colored squares always displayed on the infrared image). Second, a light blue overlay on the infrared image, the supervisor can use it to identify and visualize the pixels with enough contrast. The blue overlay is computed by the system only in detection mode so this feature must be use with the detection active. The two functions are coupled so the green zones (inactive for the gas detection) are not blue.

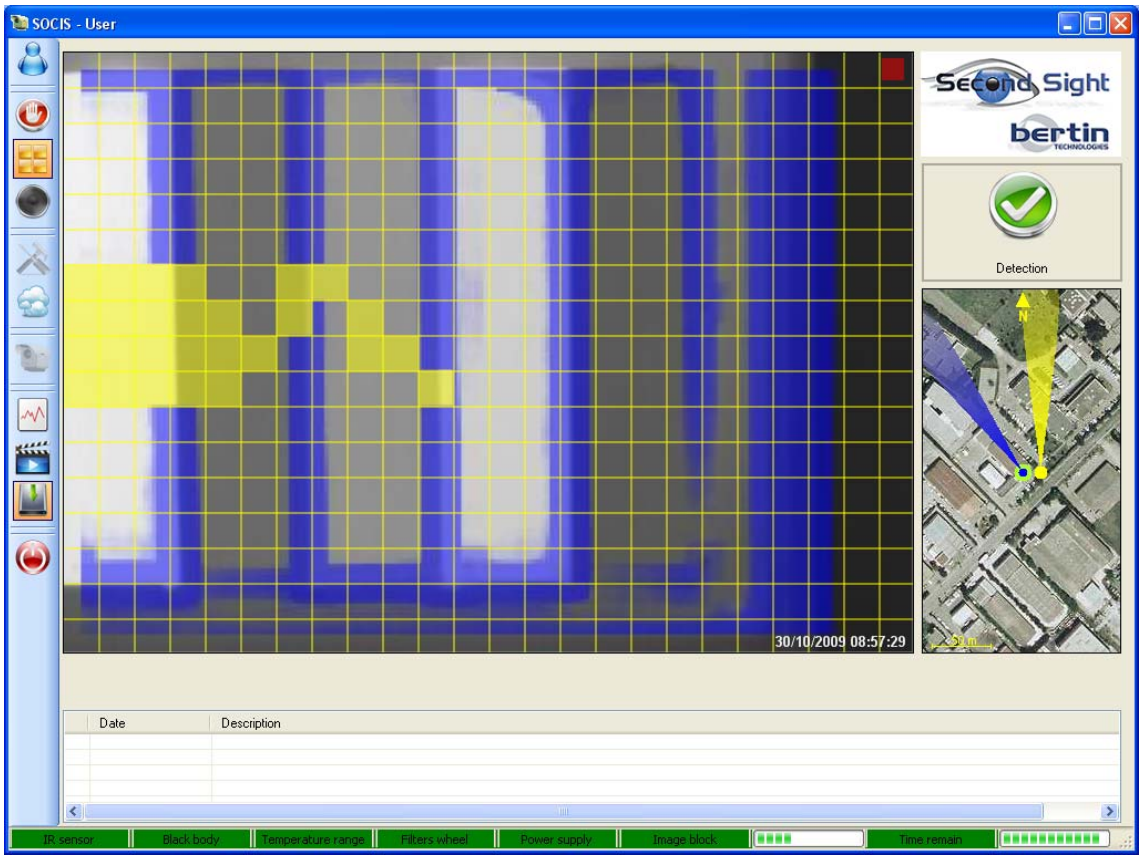


Figure 36: Active and Inactive Zones

This action is restricted to users according to their security level.

- User level: Disable
- Supervisor level: Enable

6.2.4.4 Mute Buzzer Alarm

The following button can be use by the operator to enable/disable the buzzer alarm on the camera.

Figure 37: Mute Buzzer Icon

This action is user's level dependant:

- User level: Disable

- Supervisor level: Enable

6.2.4.5 Administrator Configuration

Some software parameters can be defined by the administrator, a click on the icon open the window.

Figure 38: Configuration Icon

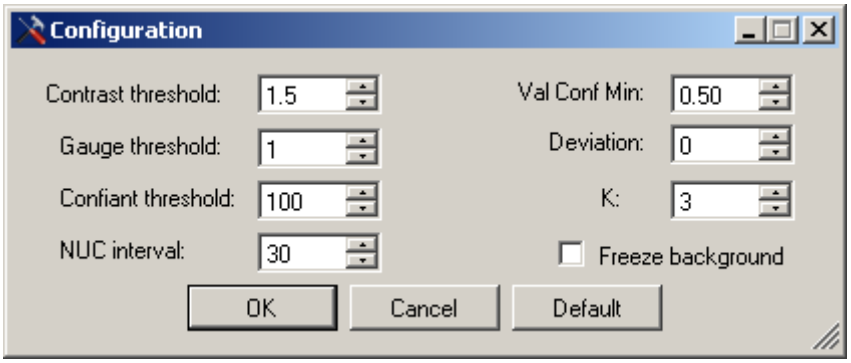


Figure 39: Configuration Window

- Contrast threshold: This value is the minimum level of contrast to be able to have detection. The higher this value the better is the detection quality but with a lower number of valid points in the image. This value need to be balanced between good detection coverage (a lot of valid points) and a high level of false alarm. With a poor contrasted background this value can be set to 2, with a well contrasted background this value can be set to 5. A value under 3 will increase the false alarm rate.

  Default value: 3

- Gauge threshold: This value represent the minimum concentration level of an analyzed cloud, a value of X mean that we look for a cloud with a minimum concentration set to the alarm threshold divided by X. The higher this value the lower the minimum gas concentration takes into account. This value need to be balanced between a good detection of “small” cloud and an increase of the number of cloud (false alarm cloud) detected by the system.

  Default value: 1

- Confidant threshold: This value is the minimum confidant level to start an alarm.

  Default value: 100

- NUC interval: It’s the time (in minutes) between two consecutive Non Uniformity Correction (NUC) of the focal plane array of infrared detectors.

  Default value: 30

- Val Conf Min: This value is the minimum of the confident level to visualise the cloud (in false colour) in the image.

Default value: 0.5

- Deviation: This value concerns the spectral correlation between the live signal and the recorded finger print in the data base. The higher this value the lower the selectivity of the spectral correlation. This value need to be balanced between a very precise identification of the finger print of the gas and a more tolerant detection of a mixed gas for example. The higher this value the higher the false alarm level of course.

  Default value: 0

- K: This value concerns the temporal aspect of the signal. To be detected a gas cloud must be present in K images over K+1. A high value of K decrease the false alarm rate, but also increase the response time before an alarm.

  Default value: 3

- Freeze background: This box is use to suppress the automatic zeroing of the signal. This zeroing is avoided automatically in case of alarm, so the system can follow the evolution of the moving (or not moving) cloud.

  Default value: non active

At the first start the system will upload all the default setting.

This action is user's level dependant:

- User level: Disable
- Supervisor level: Disable
- Administrator level: Enable

6.2.4.6 Gas Selection

Click on a gas icon and the list of proposed gases will appear. A layer appears in the first column for each selected gas.

Figure 40: Gas Icon

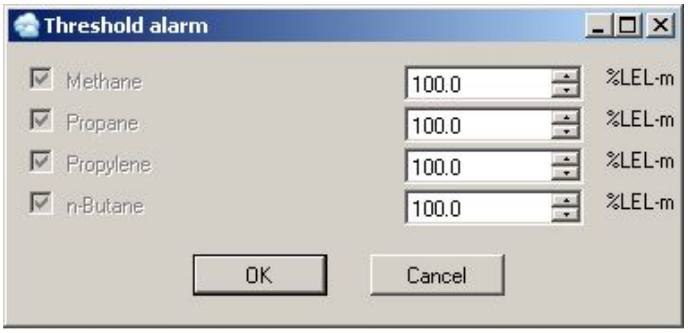


Figure 41: List of Gases

The Second Sight camera filters are configured for specific gas and the number of gas detection is based on the filters in the system. Only four gases in the list can be selected. When the system is in detection mode, the presence of gases in the field is display as an overlay image on the IR image.

For each gas, the default value of the alarm threshold is in %LEL-m and illustrated in the second column. This value can be change by a click on the line.

This action is user's level dependant:

- User level: Disable
- Supervisor level: Enable

6.2.4.7 Camera Parameters

Click on the camera parameter icon and the list of the camera characteristics will appear. Someone are user modifiable and other are factory define.

Figure 42: Camera Parameters Icon

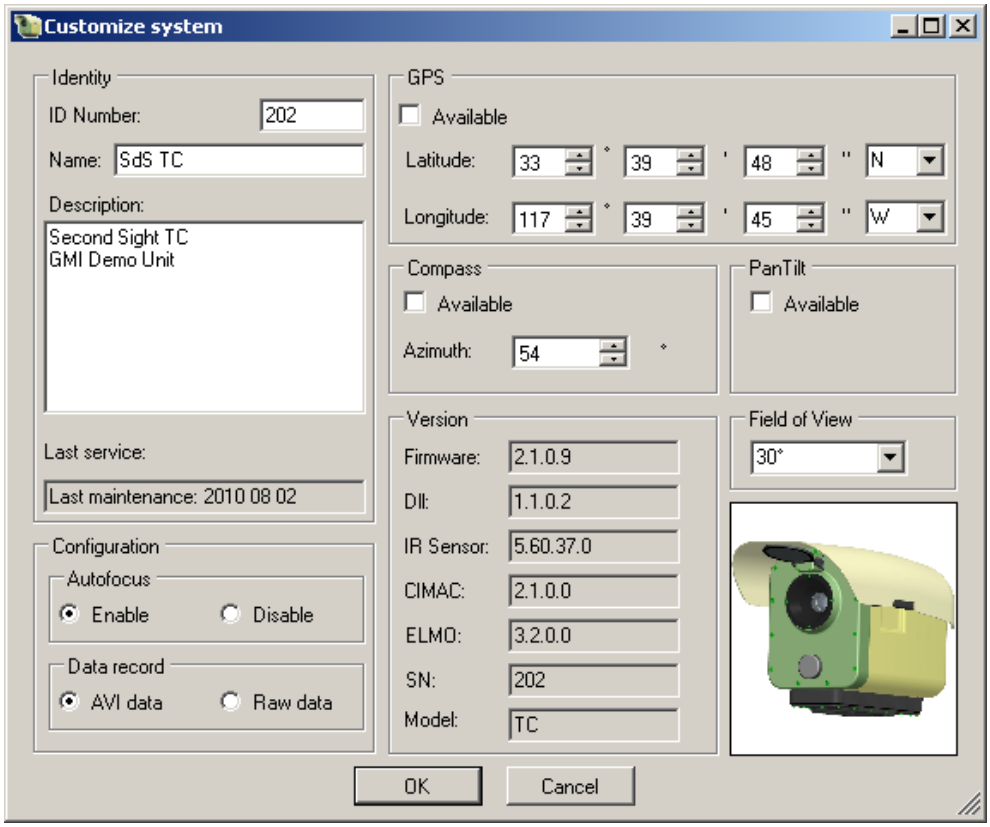


Figure 43: Camera Window

User defines parameters:

- Identification number (useful if we have many camera in the same network)
- Name of the camera (may be more explicit than a number)
- Description of the camera, position, unity name…
- Auto focus: Disable / Enable

When the autofocus function is disabled and the detection mode is off, the following buttons appear in the screen and one can manually focus the camera.

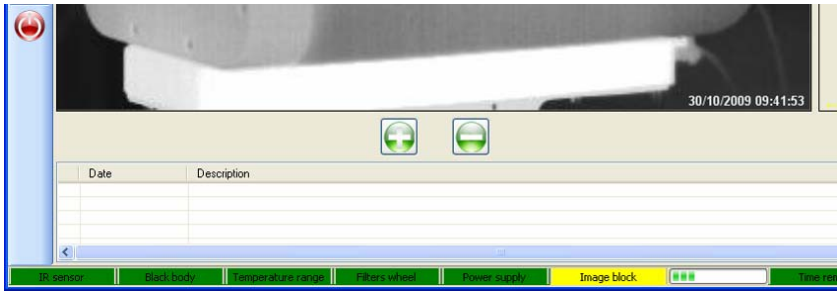


Figure 44: Manual Focus Buttons

- Recorded data: Compressed (.avi file format) or Raw (proprietary format useful in case of troubleshooting)
- Optional GPS installed or not
- If no embedded GPS, field to feel with the geographical position of the camera (WGS84 format)
- Optional compass installed or not
- If no embedded compass, field to feel with the azimuth of the line of sight (° from the North, West = 270°)
- Remote pan tilt installed or not
- Field of view of the camera

Factory defines parameters:

- Date of the last maintenance
- Firmware
- Serial number
- Model…

All this parameters are useful in case of troubleshooting to well define the camera.

This action is user's level dependant:

- User level: Disable
- Supervisor level: Enable

6.2.4.8 Graphic

Click on a graphic icon to open the graph window showing a graphic with the average concentration curves, of the gases measured over time.

Figure 45: Graph Icon

You can shrink, reset or expand the vertical and horizontal axes of the graph by using the mouse.

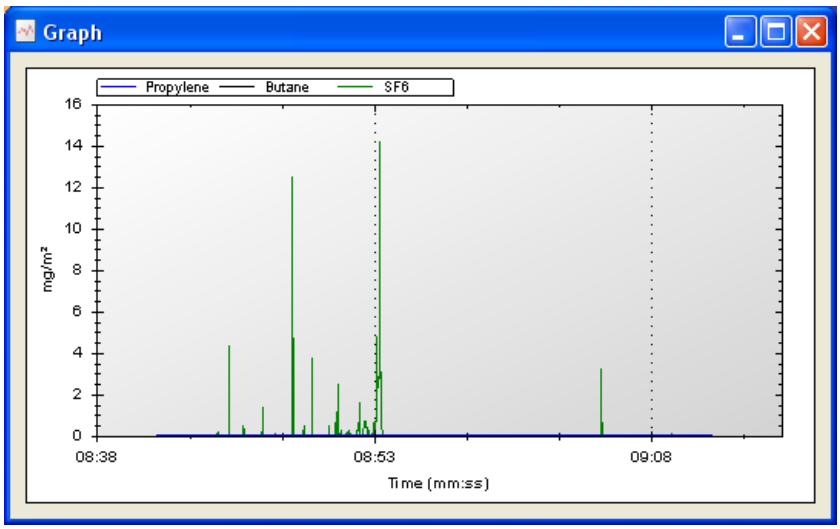


Figure 46: Graph Window

6.2.4.9 Video Recorder Icon

The Second Sight system will record a video file for each alarm. The factory setting is the file will start with the alarm and stop 2 minutes after the end of the alarm.

Figure 47: Video Icon

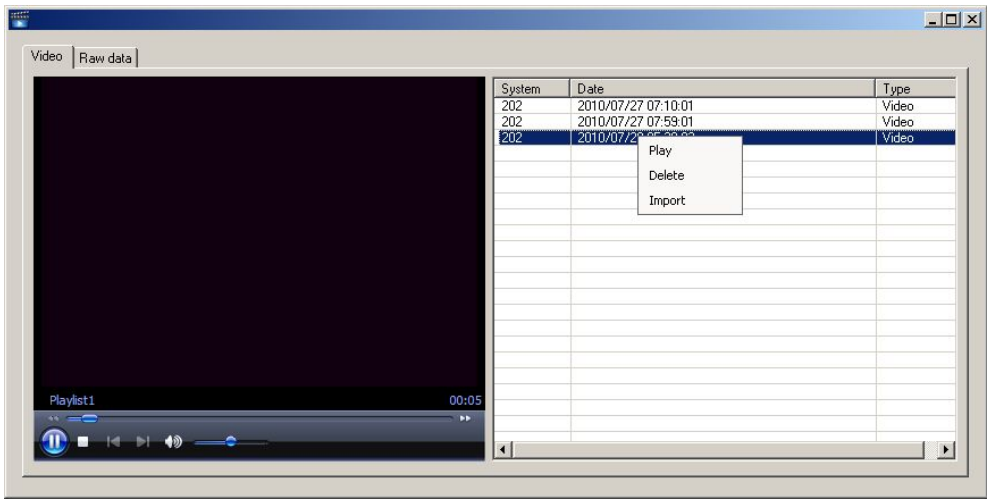


Figure 48: Video Recorder Windows

The video recorder is an operation that allows the user to return to an alarm. Use the list to select an alarm. Three actions can be performed by the recording function:

- Play
- Delete (from the camera memory)
- Import (record on the client laptop the video file)

The different buttons are the standard commands of a video recorder: rewind, fast forward, play and stop.

The RAW data tab is useful in case of troubleshooting.

6.2.4.10 Manual Record of a Video File

Click on a record icon will open the following windows:

Figure 49: Record Video Icon

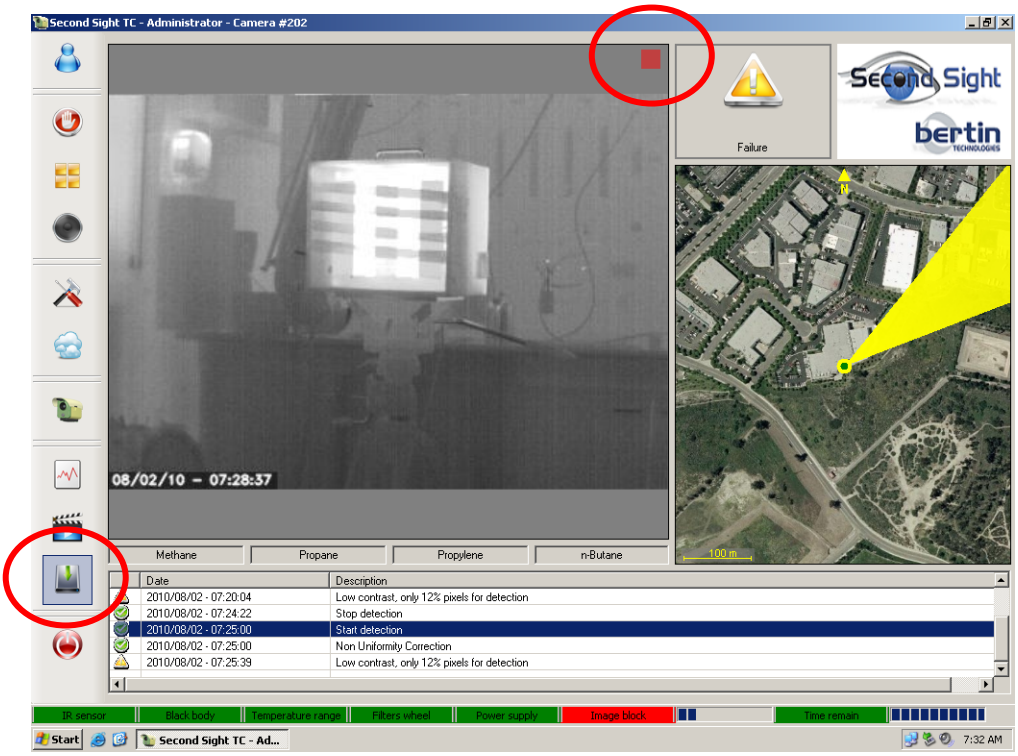


Figure 50: Recording Mode (Red Square)

This allows the user by clicking on the button to record an .AVI file of the infrared field of view as it is presented in the HMI (with the gas cloud in false colors). It is the same button, to record Raw Data, when the Raw Data mode is selected.

6.2.4.11 Shutting Down the Camera

Click on the stop icon will shut down the system.

Figure 51: Stop Icon

A warning popup will ask you a confirmation.

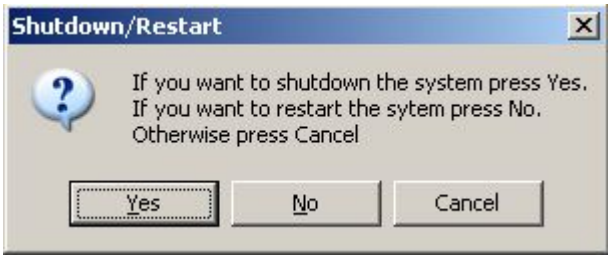


Figure 52: Confirmation Popup

If you press Yes: This will stop the camera and the embedded software. When the user tries to close the application the system saves the necessary parameters and closes the cover in order to protect the lens. To restart the system the user must perform what we have call before a “hard reboot” of the detection head, stopping it (unplug the power supply unit) for a minimum of 30 seconds, then restart (plug the power supply unit).

If you press No: The embedded computer and software will restart. This action is what we have call before a “software reboot.”

If you press Cancel: you cancel the action.

This action depends on the user’s level of security:

- User level: Disable
- Supervisor level: Enable

6.2.5 Log Tab

Use the log window to consult the various events recorded by the application. Events include change of mode, detection alarm, periodic calibrations, status notification, and user login.

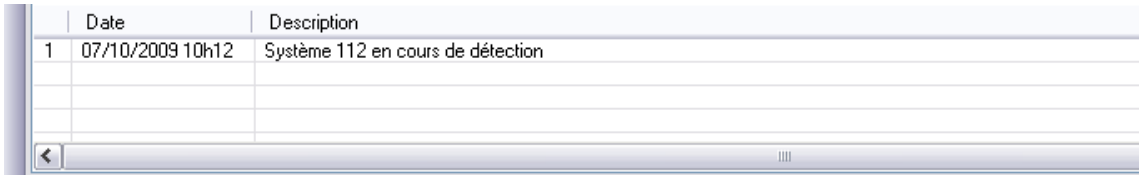


Figure 53: “Log” Window Example

A right click of the mouse on the log zone will show you some option to save and import the text file.

6.2.6 Peripherals Indicator Lights

The Second Sight system automatically checks the embedded elements in the instrument such as internal temperature probes. A series of status lights located at the bottom of the graphical user interface lets the user view the state of these various peripherals.

Figure 54: Peripheral Indicator Lights

6.2.6.1 IR Sensor Status Indicator

The indicator normally is green. If it light red, it means that the system's infrared sensor has encountered a problem.

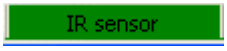


Figure 55: Infrared Sensor’s Status Indicator

6.2.6.2 Status Indicator for the Focusing and Lens Cover Command

The indicator normally is green. If it light red, it means that the system's focusing or lens cover command has encountered a problem.

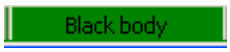


Figure 56: Status Indicator for the Lens Cover Command

6.2.6.3 Temperature Sensor Status Indicator

The indicator normally is green. If it light red, it means that the system's internal temperature sensors are out of range or defective.

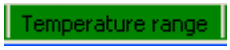


Figure 57: Temperature Sensor's Status Indicator

6.2.6.4 Status Indicator of the Filter Wheel Command

The indicator normally is green. If it light red, it means that the system's filter wheel's driver has a defect.

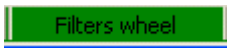


Figure 58: Status Indicator of the Filter Wheel

6.2.6.5 Power Supply Status Indicator

The indicator normally is green. If it light red, it means that the system's power supply has not enough voltage.

Figure 59: Power Status Indicator

6.2.7 Image block Status Indicator

The “Image block…” cursor gives an indication of the percentage of pixels in the image where the measurement of the gas concentration is considered by the system as “valid.” If this percentage falls below a certain threshold, the system is no longer apt to give an accurate measurement of the gas concentration in the image. The indicator normally is green; it means that we have enough valid point in the image. If it light yellow, it means that we have low valid point in the image, but the detection still work. If it light red, it means that we have not enough valid point in the image and the detection is no longer possible. This status will be indicated to the user by a change of the general operational indicator.

Figure 60: Image Block Bar Graph

When the image block indicator is red the gas detection is not operational and the yellow indicator light turns on.

Figure 61: Non-accurate Measurement Indicator Light

6.2.8 Count Down Before Calibration

The “Time before calibrating the IR camera” gives an indication of the time that remains before the system makes a new calibration of the infrared camera (NUC). This occurs every thirty minutes and the calibration lasts less than 40 seconds. During this time the gas detection is not operational and the yellow indicator light turns on.

Figure 62: Countdown before Calibration

6.2.9 Map Display

We can see on the map the position of the camera and the field of view. The position (and the line of sight) and the field of view can be defined manually in the camera characteristic window.

Figure 63: Map Display

A click on the map zone will ask you if you want to add a map. Then the software will ask you an image in JPEG format and you have to feel the geographical coordinates (WGS84 format) of the 2 opposites angles (top right and bottom left) of the image.

So this action is user's level dependant:

- User level: Disable
- Administrator level: Enable

6.2.10 About

When you press the F1 button on the keyboard, the following windows appear:

Figure 64: About Second Sight Client Software

A click on the OK button will close this window.

7.0 Installing Client Software

7.1 Installation Guidelines

7.1.1. Action #1: Uncompress the Software

Create a new folder.

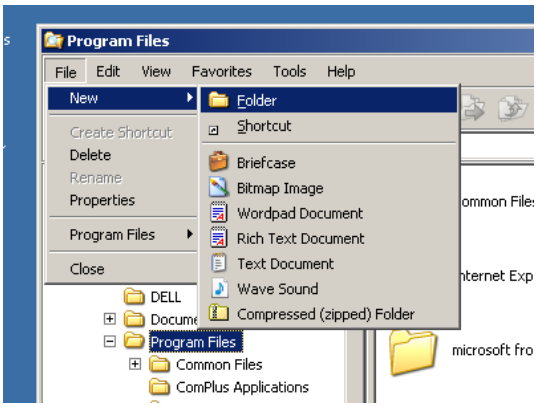


Figure 65: Create a New Folder

Name it as C:\Program Files\SecondSightClient

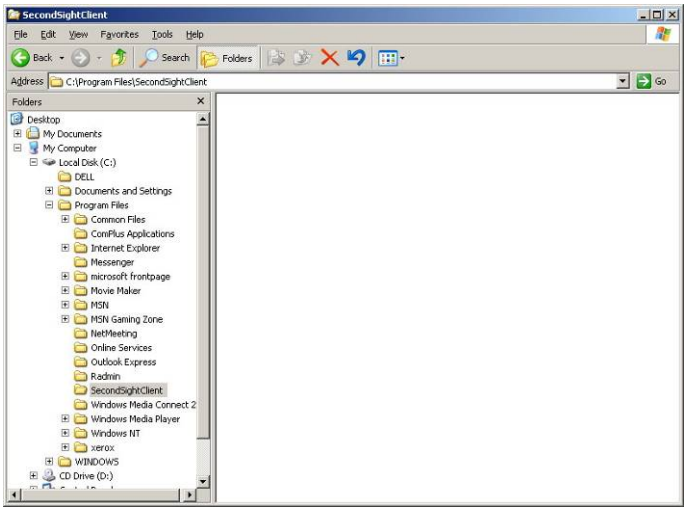


Figure 66: New Second Sight Client Empty Folder

Uncompress in this new folder the SecondSightClient.zip file.

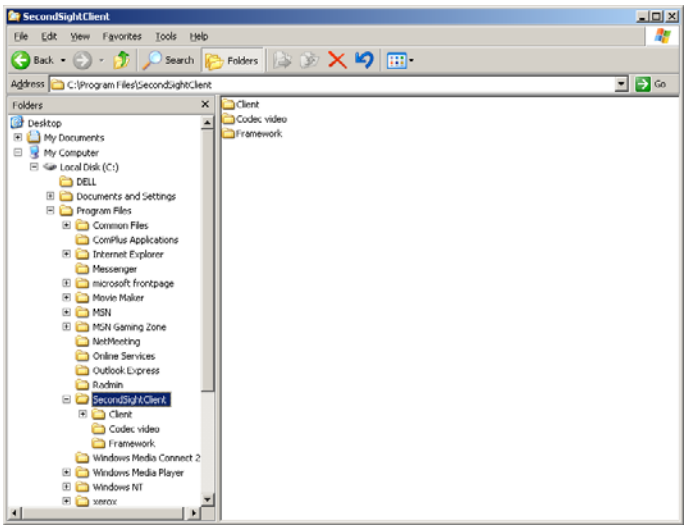


Figure 67: Second Sight Client Folder

Create a shortcut on the Desktop of the SdSclient file. With a right click of the mouse choose “send to Desktop’ (create shortcut).

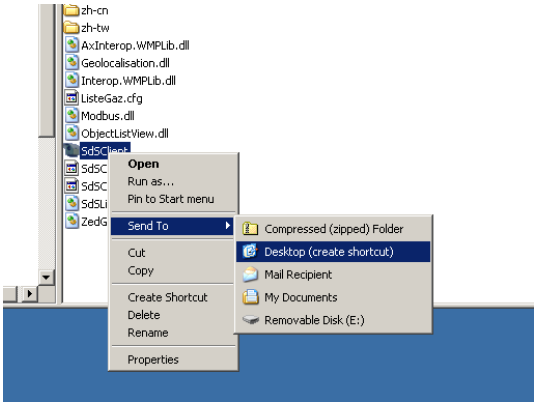


Figure 68: Create a Shortcut

On the desktop rename the shortcut as SdSClient.

Figure 69: SdSClient Shortcut Icon on the Desktop

7.1.2. Action #2: Installation of the XviD Codec

To be able to read the recorded and compressed alarm video file the system need the XviD Codec. Install the XviD video codec by launching the installation wizard.

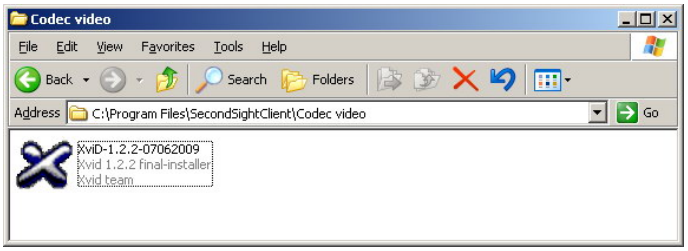


Figure 70: The XviD Final Installer

Follow the instruction by clicking on next and finish. The wizard will automatically create an XviD folder.

7.1.3. Action #3: Installation of the Microsoft Framework V2.0

The Second Sight Client Software needs the Microsoft Framework V2.0 (or higher).
Install the framework V2.0 tools (Microsoft Corporation) by launching the installation wizard.

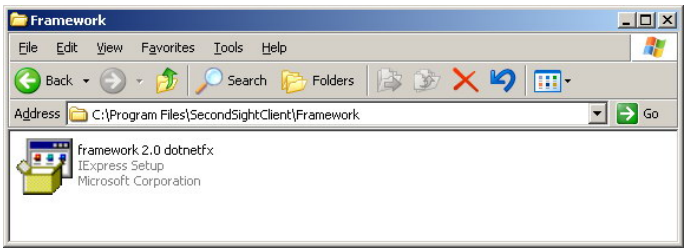


Figure 71: The Framework Express Setup

Follow the instruction by clicking on next and finish. The wizard will automatically create a Framework folder.

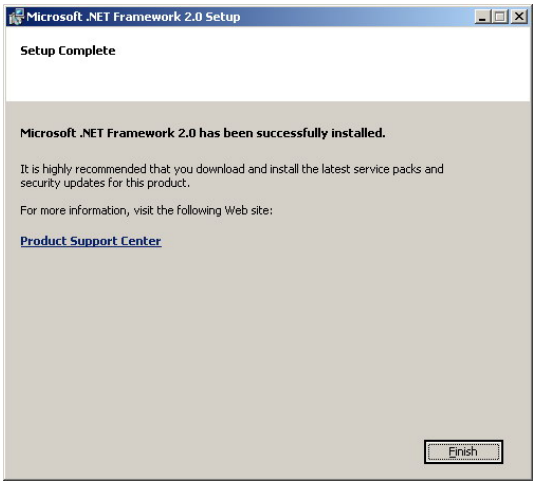

Microsoft .NET Framework 2.0 Setup
Setup Complete
Microsoft .NET Framework 2.0 has been successfully installed.
It is highly recommended that you download and install the latest service packs and security updates for this product.
For more information, visit the following Web site:
Product Support Center
Finish

Figure 72: Last Screen of the Framework 2.0 Installation

At this step, all the needed software is installed.

7.1.4. Action #4: Network Parameter

To have a good communication between the laptop and the Second Sight TC camera we need to control some parameter of the Ethernet network. Open the local Area Connections Properties windows.

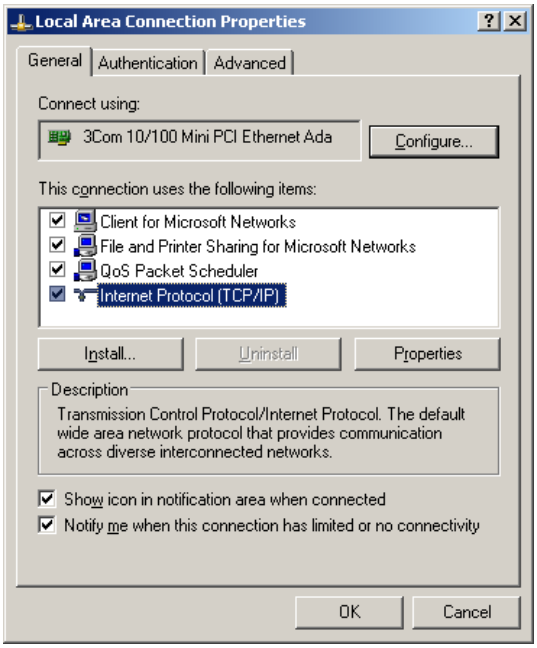
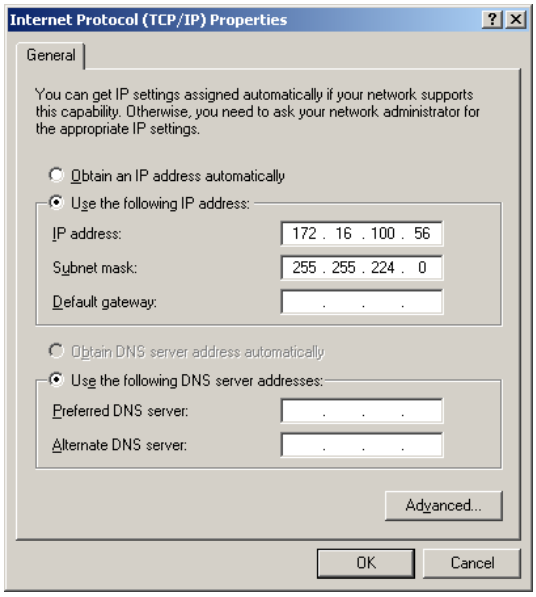


Figure 73: Local Area Connections Properties Windows

Select the Internet Protocol TCP/IP click on properties.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
172 . 16 . 100 . 56
Subnet mask:
255 . 255 . 224 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Select “Use the following IP address.” Manually write the IP address: 172.16.100.xxx (1 < xxx < 255) except the value of the camera’s serial number and manually write the subnet mask: 255.255.224.0. Then click on “OK.”

7.2 Firewall and Network Parameters

7.2.1 Action #5: Firewall Parameter

If the client laptop uses the Windows firewall we have to add some exceptions.

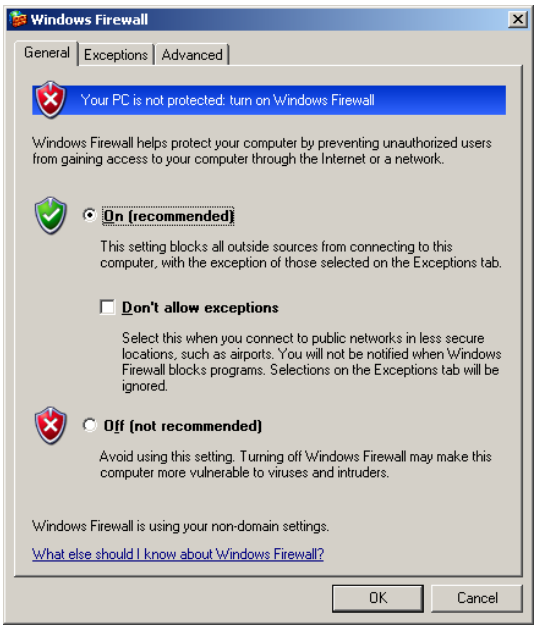

Windows Firewall
General
Exceptions
Advanced
Your PC is not protected: turn on Windows Firewall
Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.
On (recommended)
This setting blocks all outside sources from connecting to this computer, with the exception of those selected on the Exceptions tab.
Don't allow exceptions
Select this when you connect to public networks in less secure locations, such as airports. You will not be notified when Windows Firewall blocks programs. Selections on the Exceptions tab will be ignored.
Off (not recommended)
Avoid using this setting. Turning off Windows Firewall may make this computer more vulnerable to viruses and intruders.
Windows Firewall is using your non-domain settings.
What else should I know about Windows Firewall?
OK
Cancel

Figure 74: Firewall Window

Select the Exceptions tab.

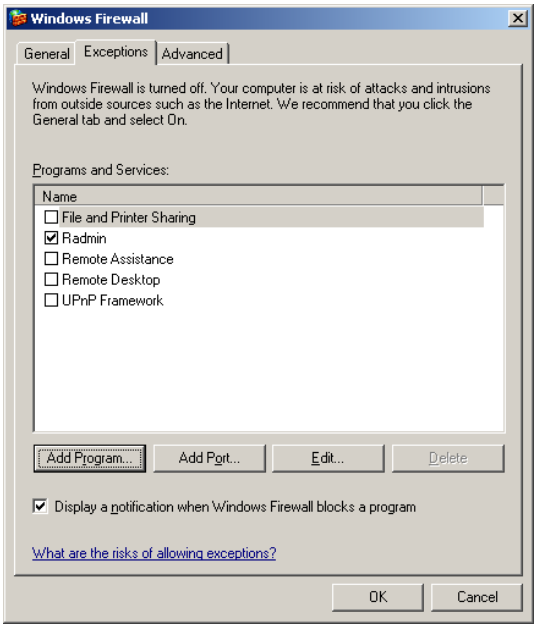


Figure 75: Firewall Exceptions Tab

Click on the “Add Program…” button, and browse the folder to select the SdSClient.exe software.

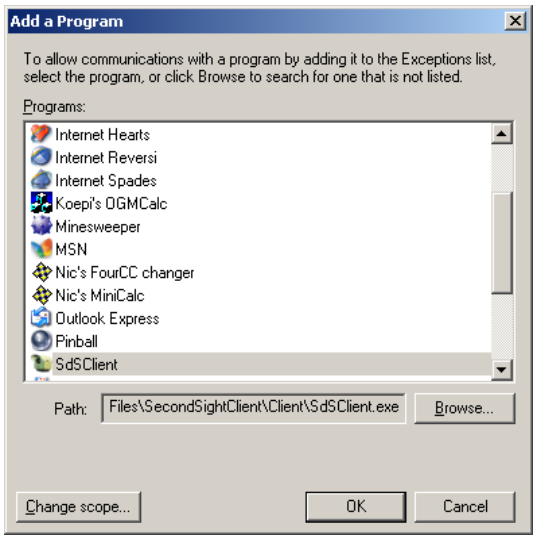


Figure 76: Selection of SdSClient Software

After adding the Second Sight Client Software selects it in the list.

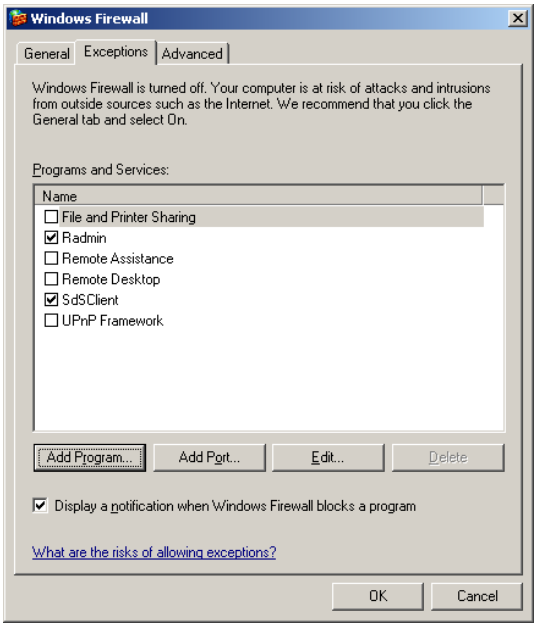
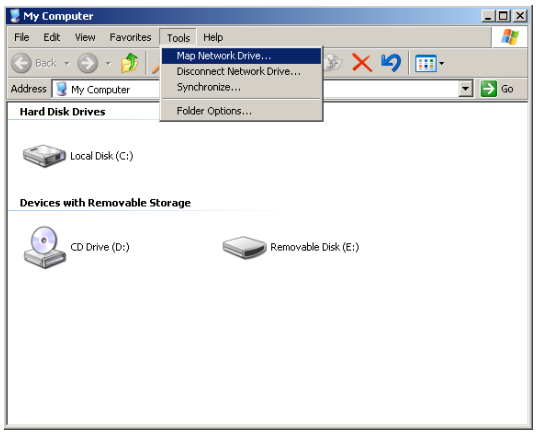


Figure 77: Selection of Exceptions Software

Now the Second Sight Client software can discuss thru the Windows Firewall with the camera server software.

7.2.2. Action #6: Create a Remote Drive

In the “My Computer” windows select in the “Tools” menu the “Map Network Drive…” tab.



Manually fill the lines Drive: Z: and Folder: \\172.16.100.xxx\Log$, where “xxx” represent the serial number of the Second Sight camera. Then click “Finish.”

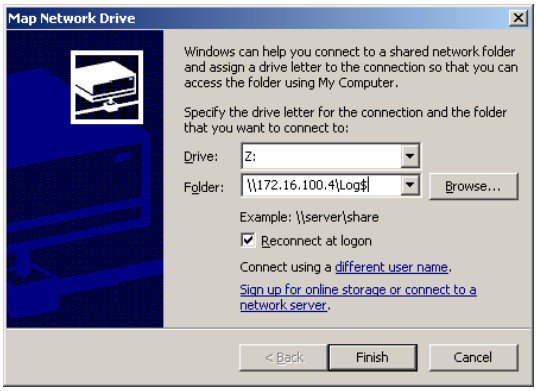

Map Network Drive
Windows can help you connect to a shared network folder and assign a drive letter to the connection so that you can access the folder using My Computer.
Specify the drive letter for the connection and the folder that you want to connect to:
Drive: Z:
Folder: \\172.16.100.4\Log$
Browse...
Example: \\server\share
Reconnect at logon
Connect using a different user name.
Sign up for online storage or connect to a network server.
< Back
Finish
Cancel

Figure 78: Mapping Network Drive Z:

7.3. SdSClient First Use

7.3.1. Action #7: Create Administrator Account

When a user launches the Second Sight client software for the first time, he must create an administrator account. To create this account, please enter a login name, a password, and the password confirmation. When done, press the “Add” button.

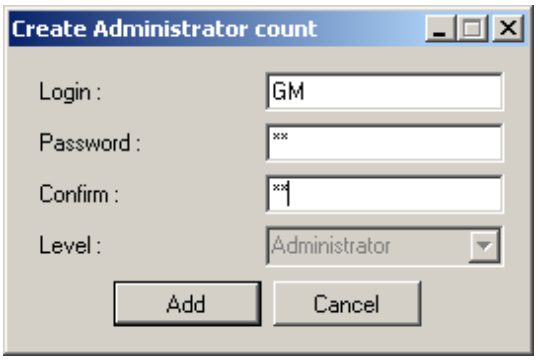


Figure 79: Create Administrator Account

The installation and the parameterization of the Second Sight Client Software are now finished and it is ready to work.

8.0 Modbus Interface

The following picture shows the Second Sight TC camera:

Figure 80: Second Sight TC

All the connectors are on the rear face of the camera.

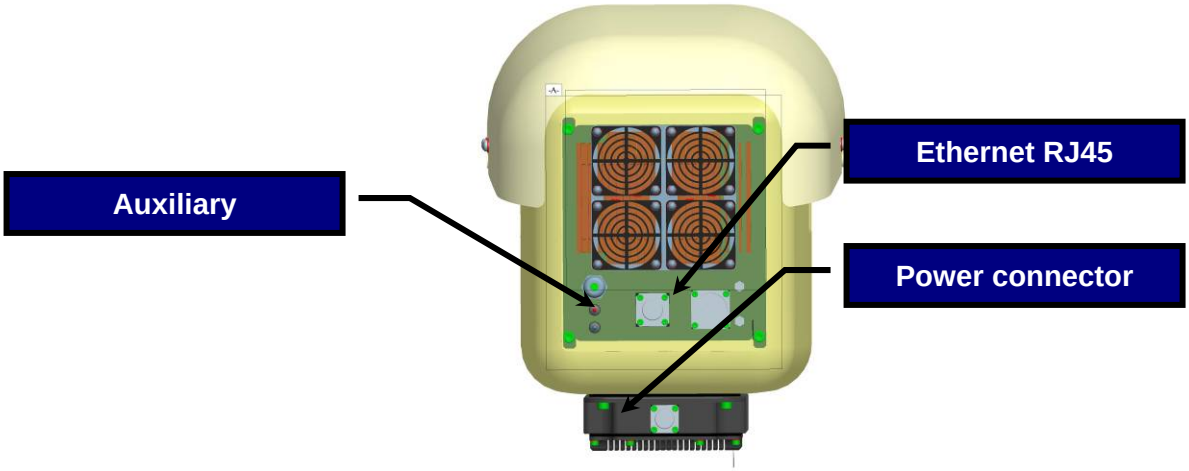


Figure 81: Back View of Camera

8.1. Ethernet RJ45 Socket

The Ethernet socket is a SOURIAU RJF21G. This connector is compatible with a normal RJ45 cable, but to insure the sealing of the connection one must use with a SOURIAU 8500-06D or SOURIAU RJF6x.

The communication link uses a Modbus TCP/IP protocol.

The infrared images are sending in binary mode on the TCP/IP link in JPEG format, the flux is one image by second.

The LOG files are sending with a CIFS protocol.

The client software is able to automatically detect the camera on the network thanks to a UDP protocol.

8.2. Auxiliary Socket

The auxiliary socket is a SOURIAU UTOW01210SH6. This connector must be use with a SOURIAU 85106RC1210P50.

The following picture describes the pin of the auxiliary connector:

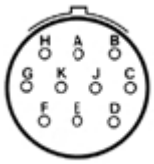


Figure 82: Pin of the Auxiliary Connector

The table describes the wiring of this connector:

Pin	Use	Affectation	Description
A	USB	5V	USB port for maintenance purpose
B		D+	
C		D-	
D		GND	
E	RS232 / RS422 / RS485	TX+	Factory define RS232, RS422 or RS485 for optional communication like the remote controlled pan tilt
F		TX- / GND	
G		RX+	
H		RX- / GND	
J	SPARE	NC	Reserved pins
K		NC	

Figure 83: Wiring of the Auxiliary Connector

8.3. Communication Protocol

8.3.1. IP Video Link

The Second Sight camera sends pictures (384 x 272 pixels) in the Jpeg standard compressed format. The frequency is about 2 Hz. The transmission use the TCP/IP protocol (Port #5000, can be modified). Information on the gas cloud is incrusted in the image (Name, Confidence level, Time…).

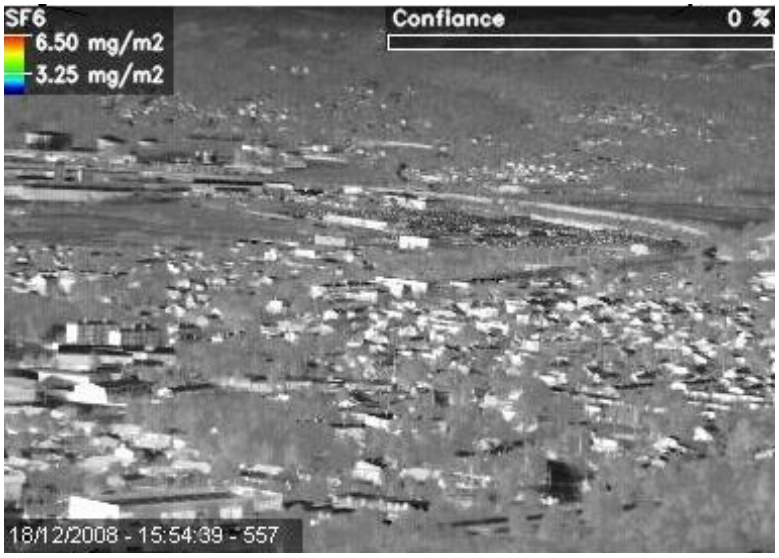


Figure 84: Infrared Image

8.3.2. Identification Protocol (UDP) Between Client and Server

When connected, the client software periodically sends a frame request on the network (port #532, can be modified). This message contains “SECONDSIGHT_CLIENT” followed by a 16 Bytes key. If a camera receives this message, it sends back a frame “SECONDSIGHT_SERVER” followed by a modified 16 Bytes key. This 16 Bytes key is the way to secure the connection between the two systems.

8.4. Modbus IP

8.4.1. ModbusProtocol

The Modbus protocol is used to establish a communication in a “client – server” mode on the Ethernet TCP/IP network.

There are 4 different types of messages:

- Request
- Confirmation
- Indication
- Response

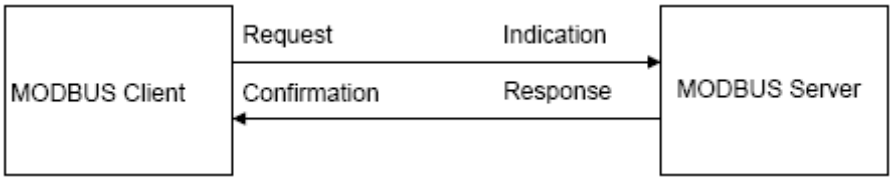


Figure 85: Modbus Link

The “Request” is the frame sends by the client to start to communication.

The “Indication” is the request receives by the server.

The “Response” is the frame sends by the server.

The “Confirmation” is the response receives by the client.

The Modbus protocol (client / Server) is used for real time information exchange.

When the Modbus protocol is used on a TCP/IP network, the frame is encapsulated as:

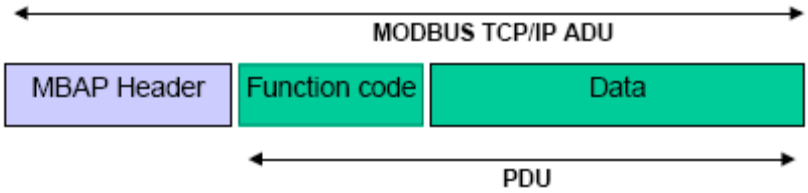


Figure 86: Modbus TCP/IP Encapsulated Frame

The MBAP header contains:

Champ	Size	Description	Client	Server
Transaction identification	2 Bytes	Identification number of the Request / Response	Init by the client	Send by request to the client
Protocol identification	2 Bytes	0 for the Modbus protocol	Init by the client	Send by request to the client
Size	2 Bytes	Size in Byte of the frame	Init by the client	Send by request to the client
Distant system identification	1 Byte	Distant system identification	Init by the client	Send by request to the client

Figure 87: MBAP Header

8.4.2. Functions Codes

In the case of Second Sight the Function Codes are:

Function Code #	Description
8	Communication link status
21	Read of the camera ID
6	Send an order
3	Read of the system parameters
5	Read of the detection parameters
16	Write of the system parameters
15	Write of the detection parameters
4	Read of the system status
9	Read of the zones of interests
17	Write of the zone of interests

Figure 88: Function Codes

The first address is 0x0001.

8.4.3. Identification

Function code #21, read access. This information is in an integer 16 bits format. The following table shows all the available parameters:

Address	Functions	Status
1	ID number of the camera	Integer 16 bits
2-3	Server software version	4 Bytes
4-5	Detection software version	4 Bytes
6-7	Infrared camera driver version	4 Bytes
8-9	Mechanical driver version	4 Bytes
10-11	Filter wheel driver version	4 Bytes
12-13	Modbus communication version	4 Bytes
14	Serial number of the camera	Integer 16 bits format
15	Second Sight model	Fixed to 2

Figure 89: Identification Parameters

8.4.4. Commands

Function code #6, write access only.

This function code is used by the client to send command to the camera; these commands are in an Integer 16 bits format. The following table shows all the available commands:

Address	Functions	Status
1	Shut down or sleeping mode of the camera	0: Shut down the camera 1: Sleeping mode 2: Restart the camera
2	Start or stop the detection	0: Stop the detection 1: Start the detection
3	Manual focus	0: Move backward of X steps[5] 1: Move forward of X steps
4	Start an automatic search of the best focus	0: Search on the whole position 1: Fine search around the actual position
5	Black out, for discretion purpose	No parameters
6	Remote control of the optional pan tilt	1: Upward rotation at 1°/s 2: Right rotation at 1°/s 3: Left rotation at 1°/s 4: Downward rotation at 1°/s 5: Stop moving
7	Record of the video file	0: Off 1: On

Figure 90: Available Commands

8.4.5. System's Parameters

Function code #3, read access.

Function code #16, write access.

These parameters are in an Integer 16 bits format.

The following table shows all the available parameters:

[5] The X number of moving steps is define in the system's parameters.

Address	Functions	Status
1	Number of step for the focusing motor	Integer 16 bits
2	Auto focus	0: Off 1: On
3	Buzzer	0: Off 1: On
4	Light	0: Off 1: On
5	GPS available	0: No 1: Yes
6	Compass available	0: No 1: Yes
7	Motorized pan tilt	0: No 1: Yes
8	File format for data record	1: Compressed AVI files format 2: Raw data
9	Horizontal field of view	12°, 30° or 60°
10-13	Longitude	4 integers (16 bits) example 04°07'53" E
14-17	Latitude	4 integers (16 bits) example 43°17'32" N
18	Azimuth	Integer (16 bits) in ° from the North (0° for the North and 90° for the East)

Figure 91: System's Parameters

8.4.6. Detection's Parameters

Function code #5, read access.

Function code #15, write access.

These parameters are in an Integer 16 bits format.

8.4.7. Status

Functions code #4, read access only.

These function code are used by the client software to know the status of the Second Sight camera, in 16 bits integer format.

The following table shows all the available commands:

Address	Function	Status
1	General status of the camera	1: Init 2: Focusing in progress 2: Non Uniformity Correction in progress 3: System ready detection stopped 4: Detection mode 5: Alarm Negative value for default (see the annex #1 for error code)
2	IR detector status	0: IR detector Ok -1: Com default -2: Sensibility default -3: Time default -4: Temperature default -5: Memory default
3	Pilot motor board status (Focus and Black body)	0: Board Ok -1: Com default -2: Black body default -3: Focus default -4: Front switch default -5: Back switch default
4	Pilot of the filter wheel	0: Board OK -1: Com default -2: Init or zero default -3: Motor default -4: Temperature default
5	GPS status	0: GPS Ok 1: Uninstalled GPS -1: Com default -2: Positioning default
6	Compass status	0: Compass Ok 1: Uninstalled compass -1: Com default

Address	Function	Status
7	Remote pan tilt status	0: Remote pan tilt Ok 1: Uninstalled pan tilt -1: Com default -2: Position default
8	CPU board status	0: CPU Ok -1: Storage media E: default -2: Temperature default -3: Insufficient memory default -4: Computing time default
9	Compass azimuth	Integer (16 bits) in ° from the North (0° for the North and 90° for the East)
10	IR detector temperature	Integer 16 bits format, in degree Celsius
11	Pilot of the filter wheel temperature	Integer 16 bits format, in degree Celsius
12	Horizontal position of the remote pan tilt	Integer 16 bits format
13	Vertical position of the remote pan tilt	Integer 16 bits format
14	Detection in progress	0: Detection Off 1: Detection On
15	Video file recording	0: Record Off 1: Record On
16-19	Time & date of the system	Clock ticks number corresponding to the date. Integer 64 bits format
20	Detector sensibility	Integer 16 bits format
21-22	Time before the next Non Uniformity Correction	Integer 32 bits format in seconds
23-26	Longitude (GPS)	4 Integers 16 bits format (04°07'53" E)
27-30	Latitude (GPS)	4 Integers 16 bits format (43°32'38" N)
31	System black out	0: Off 1: On
33-96	Gases detection results (up to 32 gases)	Integer 32 bits format for each gases corresponding to the estimate concentration.
97-130	Detection confidence (up to 32 gases)	Integer 32 bits format for each gases

Address	Function	Status
131-164	Gas alarm (up to 32 gases)	For each gases: 0: No alarm 1: Alarm On

Figure 92: Status

8.4.8. Zones

Function code #9, read access.

Function code #17, write access.

These function code are used by the client software to know the inhibited zones or to define the inhibited zones, in 16 bits integer format.

The zone is an area of 24 raw and 17 lines.

The following table shows all the available commands:

Address	Functions	Status
0x0001- 0x0199	Zones	0: Detection On 1: Detection Off

Figure 93: Inhibited Zones

8.4.9. CIFS Protocol

This protocol is use for the share of the:

- Event recorded in the log file
- Alarm video file.

All the events and the video alarms files are recorded in a log file, they are accessible in a read only access mode from the client software (thank to a network share of the files).

8.4.9. Video Alarms Files

The shared directory inside the camera with all the recorded video files is in read and suppress access mode thanks to the client software. This directory contains also a text file describing all the video and alarms files.

8.4.10. Log File

In the same way, the log file is accessible only by the client software in a shared directory.

8.5. Annex 1

Error codes	Signification
-1	Infrared detector default
-2	Focus or external flap driver default
-3	Filter wheel driver default
-4	GPS default
-5	Compass default
-6	Remote pan tilt default
-7	Processor default
-8	Black body flap motor default
-9	Focusing motor default
-10	Power supply default
-11	Low batteries level

Figure 94: Error Codes

9.0 Maintenance and Warranty

9.1. Maintenance

The system requires low maintenance. The Second Sight TC camera is fitted with an auto calibrating feature. Every 30 minutes, a 30 second auto calibration takes place. The system's internal software computes the calibration parameters with a black body (external flap). During this auto calibration, the system is inhibited.

Seven potential faults are permanently monitored:

- Infrared camera
- Filters wheel
- Calibration black body (flap)
- Focusing system
- Internal temperature
- Contrast of the image

Figure 95: Non-accurate Measurement Indicator Light

If the system is permanently in “contrast fault,” the lens must be cleaned. A visual check of the windows has to be done from time to time depending on the amount of dust in the environment.

Once a year, the IR gas cloud imaging system must be serviced for maintenance. The service can be performed either at the factory, or upon consultation with Bertin, at the place of installation. The following tasks are performed as part of routine maintenance:

- Cleaning of all the internal optics (lenses, filters and IR detector)
- Inspection of the infrared window
- Inspection of the cooling fan
- Change of internal desiccant
- Check the system fault diagnostic

Any of the inspected parts above will be replaced if found excessively worn or defective.

In most countries it is illegal to dispose of the battery with other garbage. General Monitors has a Recycle Program in place to recycle the used batteries.

NOTE: The removal of particulate matter and any film buildup on the external windows is necessary to ensure proper sensitivity of the system. It is recommended that the windows be cleaned at least every 30 days if the detector is located in a particularly dirty environment.

9.2. Obtaining Service

The Second Sight TC IR gas cloud imaging camera contains no user serviceable parts. To obtain information regarding factory service, contact General Monitors or your General Monitors representative. Please have the following information available:

- Instrument model number (on the nameplate)
- Instrument serial number (on the nameplate)
- Description of the problem

9.3. Warranty

Caution: There are no user serviceable parts inside Second Sight TC. Work performed by persons not authorized by Bertin Technologies or General Monitors will void the warranty.

Bertin Technologies warrants the Second Sight TC IR gas cloud imaging camera to be free from defects in workmanship or material under normal use and service within one year from the date of shipment.

Bertin will repair or replace without charge any equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective or damaged equipment will be made by Bertin personnel.

Defective or damaged equipment must be shipped prepaid to Bertin or the representative from which shipment was made. In all cases, this warranty is limited to the cost of the equipment supplied by Bertin. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

All warranties are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without Bertin's approval or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

Except for the express warranty stated above, Bertin disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of Bertin for damages including, but not limited to, consequential damages arising out of / or in connection with the use or performance of the product.

10.0 Troubleshooting Guide

The following table lists potential problems that can affect the Second Sight TC camera. Follow the individual steps to pinpoint and define circuit ailments.

This section is intended to be a guide in correcting problems which may arise in the field. General Monitors should be contacted for assistance if the corrective action listed does not eliminate the problem.

Condition	Possible Solution
The Second Sight system does not start	The boot procedure takes about 30 seconds. Wait until camera finishes the booting sequence. Check the power supply cable and the power supply.
Camera appears to operate normally, but the HMI does not appear in the PC	Check Ethernet cable is properly connected to PC and detection head, check in the taskbar of the computer desktop whether network is connected, and check if IP address conflicts with that of the PC. If connection problem persists, start a new session.
All status indicators in HMI interface are blinking	Stop and restart the Second Sight software (soft reboot). Otherwise, try to shut down the system with the power supply, wait for 30 seconds, and restart camera (hard reboot).
The temperature sensor status indicator is blinking	The heat sink and the fan may be dirty. If this is the case, clean heat sink and fan. The heat sink and the fan should be cleaned regularly. The temperature sensor or the fan may be defective. Call Bertin Technologies or assigned representative for repair.
Orange indicator is on	The system is in self-calibrating mode. Wait for 30 seconds. Check the IR window – a dirty window produces low contrast in the image. If the field of view doesn't have enough contrast, try changing the angle of the camera or its location.
The system displays a fuzzy image	Check the IR window and clean it. If focus is not sharp then stop the detection and restart the camera. The internal auto focusing system will fix the problem. Otherwise, call Bertin Technologies or assigned representative for repair.

I see clouds or spots in the HMI screen, but the camera is not alarming	Check whether relevant gases have been selected for gas detection. Appearance of small spots or flashes of color on the screen are no indication that a gas cloud is present. The camera determines alarm condition by averaging gas concentration across a selected zone. Thus, the size and the place of the zone of interest are very important. Call Bertin Technologies or assigned representative for assistance in the design of the zones.
I cannot change or select new gases in the gas selection table	When the system is in detection mode, one cannot change the selected gases. In order to reconfigure the camera, stop the detection and select a new gas in the selection table. A user must have the appropriate user authorization to add or remove gases to be detected from the list.
I know that gas clouds are present in the field, but the camera is not alarming	Check whether relevant gases have been selected for gas detection; ensure all tile zones are active; check the value of the alarm threshold.
Instrument no longer saves video images	Check available hard drive space. If disk is full, save files to external disk. If sufficient memory space is available, call Bertin Technologies or assigned representative for assistance
Instrument constantly alarms even if there is no gas in the field	Inspect the background to see if there is any moving object near camera. Avoid large moving objects in the field of view or reconfigure the detection zone to avoid the moving object.

Table 2: Troubleshooting Table

11.0 Customer Support

General Monitors' Offices

Area	Phone/Fax/Email
UNITED STATES	
	Toll Free:+1-800-446-4872
Corporate Office:	Phone: +1-949-581-4464
26776 Simpatica Circle	Fax: +1-949-581-1151
Lake Forest, CA 92630	Email: info@generalmonitors.com
	Phone: +1-281-855-6000
9776 Whithorn Drive	Fax: +1-281-855-3290
Houston, TX 77095	Email: gmhou@generalmonitors.com
UNITED KINGDOM	
Heather Close	
Lyme Green Business Park	Phone: +44-1625-619-583
Macclesfield, Cheshire,	Fax: +44-1625-619-098
United Kingdom, SK11 0LR	Email: info@generalmonitors.co.uk
IRELAND	
Ballybrit Business Park	Phone: +353-91-751175
Galway	Fax: +353-91-751317
Republic of Ireland	Email: info@gmil.ie
SINGAPORE	
No. 2 Kallang Pudding Rd.	Phone: +65-6748-3488
#09-16 Mactech Building	Fax: +65-6748-1911
Singapore 349307	Email: genmon@gmpacifica.com.sg
MIDDLE EAST	
LOB12, #G20	
P.O. Box 61209	Phone: +971-4-8143814
Jebel Ali, Dubai	Fax: +971-4-8857587
United Arab Emirates	Email: gmme@emirates.net.ae

Other Sources of Help

General Monitors provides extensive documentation, white papers, and product literature for the company's complete line of safety products. Many of these documents are available online at the General Monitors website at http://www.generalmonitors.com.

12.0 Appendix

12.1. Specifications

Type: LWIR infrared camera
Technology: Un-cooled micro bolometer detector
Spatial resolution: 384 x 272 pixels
Spectral range: 8 to 14 µm
Spectral resolution: Up to 6 infrared filters
Horizontal field of view: 30° (12° and 60° optional)
Detection in the field:
- Update less than 2 seconds
- Detection less than 8 seconds

Sensitivity:
- Methane: 0.1 LEL-m
- Propylene: 0.1 LEL-m
- Butane: 0.3 LEL-m
- Propane: 0.5 LEL-m

Dimensions of the analysis head: 670 x 280 x 330 mm^3
Weight of the detection head: 18 kg
Temperature range in use: -10°C to +55°C (+14°F to +131°F)
Temperature range in storage: -20°C to +60°C (-4°F to +140°F)
Power supply: 220 V / 50 Hz – 100 W
HMI by portable PC
Possibility of operating several detection heads in the sensor network (Ethernet)

12.2. Software Version

This version of the user manual is compliant with the Second Sight TC Client software version 1.3.0.8

12.3. Power Supply Specifications

Input Specifications:
Input voltage: nominal 100 – 240 VAC – AC range 85 – 264 VAC
Input frequency: 47 – 63 Hz
Harmonic limits EN 61000-3-2, Class A
Input current at full load (typ.): 1.0 A @ 230 VAC, 2.0 @ 115 VAC

Output Specifications:
Output voltage adjustable range: 24 – 28 VDC
Output regulation (10 to 90% load variation): 2.5%
Ripple and noise (20 MHz bandwidth): < 50 mV peak to peak
Electronic short circuit protection current limitation at 110 % typ. (automatic recovery)
Output over voltage protection <40 V
Hold-up time: > 20 ms

General Specifications:
Operating temperature range: -40 °C to +85°C
Power de-rating: above + 60 °C 2.0 %/K
Humidity: up to 100% RH with condensation
Reliability (calculated MTBF according IEC 61709): > 900,000 h @ 40°C

Safety Standards:
Information technology equipment: IEC/EN 60950-1
Control equipment for hazardous location: UL 1604 (Class I, Division 1 & 2, group A, B, C & D, T4)
Electrical equip. for potentially explosive atmospheres: IEC/EN 60079-15 (Class I, Zone 2, EEx nA IIC T4)
Industrial control equipment: UL 508
Electrical equipment for machines: EN 60204-3
Electronic equipment for power installation: EN 50178
Safety transformers: EN 61558-2-8

Safety Approvals and Certifications:
CB report: IEC/EN 60950-1
UL: UL 508 listing, UL 1604
IEC: ATEX, IECEx scheme

Case dimensions:
Case protection: IP 67 (IEC 60529), NEMA 4X rated, UL 50
Enclosure material: die-cast aluminum
Size: 174 mm x 93 mm x 56 mm (6.85” x 3.66” x 2.20”)
Weight: 1,000g (35.3 oz)

12.4. Regulatory Agency Approvals

Regulatory Agencies

The IR camera is certified by the following regulatory agencies:

- CE Mark
- CSA (CAN/CSA-C22.2 No. 61010.1-04 and UL Std. No. 61010-1 (2nd Edition))

Classification Area and Protection Methods

Second Sight TC is certified as follows:

- Protection Method Not applicable
- Area Classifications General use, non-hazardous locations

Conforms With Electromagnetic Compatibility Directive (89/336/EEC)

ADDENDUM
Product Disposal Considerations

This product may contain hazardous and/or toxic substances.

EU Member states shall dispose according to WEEE regulations. For further General Monitors' product WEEE disposal information please visit:
www.generalmonitors.com/customer_support/faq_general.html

All other countries or states: please dispose of in accordance with existing federal, state and local environmental control regulations.